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BRIEFLY TOLD.

NOTES.—

"As your readers already know, through the columns of the JOURNAL, Mr. Frank D. Moses recently resigned the position of Chief Engineer to the South Jersey Gas, Electric and Traction Company, with the organization and development of which Company he had been connected from its inception, in order to engage in the general business of gas and water works' construction. Shortly after his resignation the men who had been under his direction in the engineering department of the Company determined to give to their former Chief an evidence of their appreciation of the manner in which he had 'bossed' them. After much cogitation on their part it was decided that a loving cup would best fill the bill, and the same (a gorgeous article in silver) was ordered and brought to Trenton. On the evening of the 15th inst., the 'modest home' of Mr. Moses, which is located in the premises, No. 6 North Stockton street, Trenton, was invaded by the 'gas house workers,' who without much ado announced, through David Burns, the Company's meter inspector, why they were there. Perhaps it would be the best way out of it for me to repeat what the spokesman said on the occasion in question. Here it is:

"'Mr. Moses: Circumstances have devolved upon me a task at once pleasant and regretful; pleasant in the fact that I am spokesman in offering to you this token of good will and best wishes of the men who were under your orders; regretful in the fact that in so doing we mark the severance of a bond between you and ourselves. Recognizing as we do the position in which you were placed in the dual responsibility between employer and employee, we wish to call attention in most earnest manner to the especial care directed toward your workmen. In the improved and up-to-date gas service which Trenton and other cities in this State (with which you have had dealings) enjoy, you have a monument which will stand for years as a mark of your ability. In the name of my fellow-employees of the engineering department I present to you this token of high esteem and of best wishes for your continued success in your future efforts, and trust that your remembrances of the employees of the engineering department may be pleasant and everlasting.'"

"The moment of silence that went between the actual presentation of the handsome token and its acceptance was followed by many seconds of hearty cheering—many of those present were surprised at the cleverness of Burns as a 'public speaker.' However, the redoubtable Moses, who was evidently a bit off his usual steadiness, accepted the token in a neat speech, the pervading thought of which was compliment to the men for their faithfulness to the Company and their good support of himself. Other speeches followed (notably one by Mr. Richard Stockton), after which the 'cup' was put to practical use. It is of sterling silver, has a height of 14 inches, a base of 6 inches, a mouth of 8 inches, and a capacity of 'several quarts.' Of course, it carries a suitable inscription. The whole affair well attested the esteem in which Mr. Moses was and is held by his workmen.—C."

MR. THOMAS BAUMGARDNER, who served the Columbia (Pa.) Gas Company for some time as Superintendent, has been selected by the State Construction Company to oversee the construction of the gas works which that concern is to build at Belmar, N. J. He is a son of Mr. J. H. Baumgardner, who for a great many years was the active

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PHILADELPHIAN DEPOSIT

man in connection with the management of the Lancaster (Pa.) Gas Company.

THE authorities of Richmond, Va., have granted a "sensible appropriation" for the extension of the main system of the municipal gas works. It is to be hoped that they will now see the immediate necessity for allotting a suitable amount for the enlargement of the manufacturing plant.

"L. B.," SENDS the following, from Toronto, Can., under date of the 17th inst.: "A case of some importance to persons disposing of store premises was before the Court of Appeal a few days ago. Last month the T. Eaton Company bought the Guinane building on Younge street, and on taking possession took over the gas and other fixtures. Mr. Guinane, however, had assigned these to his son in-law, John Laxton, by whom they were assigned in turn to John Stack, who brought action in the Divisional Court to recover possession of them. The action was decided against him, and his lawyer, Mr. Smythe, petitioned the Court of Appeal for leave to appeal. The request, however, was refused, though the judges did not express any opinion on the point of law. It was plain, however, that the Chief Justice was of opinion that the fixtures were a portion of the building, as he remarked that the bricks and, in fact, the whole building might in the same way be called chattels. As the law now stands the fixtures in a store are considered part of a building, but a tenant who puts in his own fixtures is at liberty to remove them on leaving."

MR. O. B. WEBER, of Adam Weber Sons, of this city, informs us that Messrs. Graham, Morton & Co., of Leeds, England, for whom the Messrs. Weber are the agents in this country, have just installed 32 beds of inclined retorts complete, including furnaces, ironwork, charging apparatus and conveying plant, at the gas works, Milan, Italy. The "first brick" in the construction was laid March 1, 1902, and gas making was commenced the 30th of last September.

THE authorities of Holyoke, Mass., and the proprietors of the Holyoke Water Power Company have agreed upon the price at which the city will take over for operation on municipal account the gas and electric lighting plants of the Power Company. The sum to be paid is $707,000 for the manufacturing plants proper, and an additional sum of $18,000 per year, which rental is to be in perpetuity, for 12 mill powers of water, the vested right of which is in the Company. Our correspondent, in further reference to this phase of the subject, says: "The water power rental was made necessary, because the Company owns and controls the great dam and water rights from which the power is obtained." The adjudication of this case took up many months, and the history thereof, which covers many published volumes, makes very interesting reading.

THE Coast Gas Company, which is getting ready to supply gas to several towns along the lower point of the New Jersey Coast, from Bradley Beach to Manasquan, will have for its Chief Engineer, Mr. A. B. Bedle, and the General Superintendent will be Mr. Thomas Baumgardner. The towns in which gas is to be supplied include the following: Bradley Beach, Avon, Belmar, Lake Como, Neptune City, Sea Girt and Manasquan.

THE following, from a recent issue of the *American Inventor* would be important, were it true; but it is not: "Jane Hyatt, an American, 26 years old, went to Paris 6 months ago with a gas meter of her own invention, which has been accepted by both the French government and Paris Gas Company. She received $40,000 on account of her royalties. It will take 5 years before the old meters are gradually replaced. Miss Hyatt tried vainly to get her invention examined in Chicago and New York. Her meter is said to be more precise, and twice as cheap to build as any extant.

A CORRESPONDENT, writing under date of the 17th inst., incloses the following: "The Directors of the Amherst (Mass.) Gas Company have filed a petition with the Board of Gas and Electric Light Commissioners, under Chapter 450, Acts of 1894, for authority to issue $20,000 in capital stock of the Company and $30,000 in bonds. It is proposed that the bonds run 20 years at 5 per cent. with interest payable semi-annually. The petition says that $19,000 is wanted to cancel and retire the old bonded debt of $19,000 now in the form of demand notes and held by the Amherst savings bank. The balance of $31,000 is wanted to pay the debt incurred in the enlargement and improvement of the electric light plant. The petition is according to vote of the stockholders at a meeting December 17, 1901. Under the law at least half of the investments of a gas company for necessary purposes must be in stock. The tendency of a large proportionate issue of bonds at a low rate of interest is to reduce the burden the public has to bear. It is said that 5 per cent. is about as low as a company of this size can expect to issue its bonds. No date has been fixed for the hearing on the petition."

[LIMITED ABSTRACT.—Concluded from Page 706].

PROCEEDINGS, THIRTIETH ANNUAL MEETING, AMERICAN GAS LIGHT ASSOCIATION.

HELD IN THE GREEN ROOM, NEW YORK ATHLETIC CLUB, NEW YORK CITY, OCTOBER 15TH to 17TH, 1902.

SECOND DAY—THURSDAY, OCT. 16—MORNING SESSION.

[*Discussion on the Paper*[1] *by Mr. R. B. Brown, of Milwaukee, Wis., as to "Why Milwaukee Did Not Build Inclines."*]

The President invited a free discussion of the paper, stating that it was on a topic of prime importance to those in America who were proposing to reconstruct their plants.

Mr. Egner declared he could not agree with the opening statement in the paper, that the question of inclines vs. horizontals had been discussed with much acerbity. He had probably traveled more than any other member in his efforts to find out all about inclined retorts, but the discussions he had heard on the subject had always been good natured, with one exception, and that had been at a meeting of one of the English Associations, at which Mr. Herring, the Engineer to the Edinburgh and Leith corporations, and formerly of Huddersfield, England, tried to induce the advocates of stoking machinery to give facts which could be compared with the facts as to inclines, but Mr. Herring, when in the middle of his remarks, was discourteously stopped by the Secretary of the Association. At a later session, however, Mr. Herring was given an opportunity to finish his presentation of the subject. Mr. Egner said that he had endeavored to get those who favored stoking machines to give facts which could be compared with those which the advocates of inclined retorts were always ready to give, but had always been unsuccessful in that respect, for the advocates of stoking machinery would dodge the issue every time. The paper presented by Mr. Brown was one of the best arguments he had heard presented on that side—some inaccuracies of figures excepted. A statement was published in the *Journal of Gas Lighting*, March 4th, 1902, showing that in England 77 gas works were now using inclined retorts, employing 8,199 retorts, and making 107,750,000 cubic feet of gas per day. This statement would seem to indicate there was not very much opposition in England to the use of inclined retorts. On the Continent there were about the same number of inclined retorts in operation, and their use was rapidly increasing. At the last meeting of the German Association of Gas and Water Engineers, at which the paper of Herr Emil Merz, of Cassel, was read (and from which Mr. Brown had quoted), Herr Leybold, the Acting Chairman of the Association, and manager of the large gas plant at Hamburg, Germany, said: "It is well known that for years efforts to reduce the labor in the retort house have been made, which was not only evidently very hard work, but was not altogether free from objection in a hygienic view; and the aim was to simplify and reduce the cost of it as well. Consequently it was to be regarded as an important innovation when the Superintendent of the Rheims gas works, Mr. Coze, resolved to introduce the inclined retort system there for the manufacture of gas. The progress of that then innovation has been such as could not have been imagined at that time. It is a matter, of course, that such an arrangement is not evolved perfect and complete immediately from the brain of the inventor, but that it has to pass through a certain period of development before it reaches perfection, as seen at this date. From the small retort house, in which Mr. Coze erected his first bench, there have now sprung an immense number of such works, of course, always in progressive improvement and increasing perfection. These retort benches (inclines) as they are now built, for example, and as they may be seen at the new gas works at Mariendorf, near Berlin, where they have been in operation for a considerable time, have thoroughly demonstrated their utility, and we shall all be pleased, if additional experiences with such inclines that you may have gathered would be now communicated and aid us in having a lively discussion. Of course, benches of inclined retorts are not everything. You have heard in Mr. Merz's paper that apparatus for transporting the coal and coke go with it; and methods of bringing the raw material into the house and the glowing coke out of it, form an important part of the whole Consequently, the whole saving is not due alone to the inclined retorts, but also the great saving in manual labor brought about by the various conveyors is an important portion of it. I thank Mr. Merz for his clear and enlightening paper, and now ask you to enter upon a thorough discussion of the subject." The views of the members of that Association, as expressed in the discussion of the Merz paper,

1. For the text of Mr. Brown's paper, see *ante*, p. 703.

were without exception in favor of inclined retorts. It was hardly to be supposed that men like Mr. Herring, Herr Leybold and Mr. Husband, Chief Engineer of the Brentford Gas Company, near London, England, would make the mistakes implied in Mr. Brown's paper. At Brentford, where 5 million cubic feet of gas is made per day, all the horizontals have been displaced by inclines. At Granton, near Edinburgh, in a magnificent retort house just completed, only inclined retorts were placed. In two of the three gas works at Leeds, England, inclined retorts were used. Mr. Townley, the Manager of the Leeds works, stated last May that they were about to enlarge the plant and to build additional retort houses in which they proposed to put in inclined retorts. As to the cost of making coal gas in the inclined retorts, Mr. Egner stated that he had been shown a report, made to the Chief Engineer of the Gas Light and Coke Company, of London, in which was stated in detail the cost of making coal gas by manual labor, by inclined retorts and by stoking machinery; also, the cost of making water gas, or a combination of the three. That report showed that at the works where inclined retorts were used the gas cost 2 pence less per 1,000 feet than at either of the other works. He had also seen a paper, prepared by Mr. Goulden, the Deputy Chief Engineer of the same works, in which the relative cost of erection, results to be expected and cost of making gas by the different systems were carefully stated in great detail. The conclusion arrived at by Mr. Goulden was that, counting everything, including the higher cost of machinery and building for inclines, they would carbonize a ton of coal at a little over 2 pence less per ton by the use of inclined retorts than could be done by any other method. As showing the working and results obtained by the use of inclined retorts at the Crystal Palace District Gas Company, London, Mr. Egner read the following extract from a statement made by Mr. Sydney Y. Shoubridge, the Engineer of that Company, dated May 23, 1902: "The conditions of working the 10 settings of inclined retorts at the above gas works are as follows: In each setting there are 2 primary air boxes, 3 inches wide by 2 inches deep; 12 square inches area of opening; 2 secondary air boxes on furnace side, 3 inches wide by 1¼ inch opening; 2 secondary air boxes on opposite side, 3 inches wide by 1¼ inch opening; equals 19½ square inches total area of secondary air openings; 4 damper openings, 22 inches square when fully open; four 12 inches wide by 1¼ inch opening, equals 66 square inches. The main flue, tested by Jensen's flutometer gauge, gives a draught of 16 millimeters taken at the chimney and with main damper fully open. The main damper is closed down to 3 inches from bottom of flue at 8 o'clock Sunday mornings, and is opened fully again at 8 o'clock in the evening. The retorts are not charged from 6 A.M. to 10 P.M. on Sundays. The chimney is 70 feet high by 4 feet 9 inches square at the bottom, tapering to 4 feet 1 inch square at the top, inside measurements. The retorts are charged with 6½ cwts. of coal every 6 hours. The fuel used for furnaces equals 15 per cent. of the coal carbonized. The furnaces are clinkered once every 12 hours and fired up every 4 hours. At the top of setting on discharging side a pull of 6 millimeters is recorded. The seal in hydraulic main equals 2½ inches, less vacuum registered, equals 2 inches, and gives the dip-pipes a seal of ½ inch. The tar is run out of the hydraulic main tar cylinders every 8 hours, liquor being run into the hydraulic main at the same time at equal rate, so as to maintain the seal of the dip-pipes.

The number of men employed is as follows:

2 men on charging floor,	working	8	hours a day, at	6s.	per day.
2 " drawing	"	8	" "	6s.	"
2 barrow men	"	8	" "	5s. 3d.	"
2 firemen (clinkering, etc.)	"	12	" "	7s.	"

"It should be noted that the rates of wages are somewhat higher than those usually paid in the London district; also, it would be quite possible to work 5 extra settings with the same number of men. An average of a number of tests of the spent gases at the outlet of the settings shows: CO_2, 15.6 per cent.; O_2, 3 per cent.; CO, 0 per cent. And of the producer gases: CO, 23 per cent.; O_2, .04 per cent.; CO_2, 2.8 per cent.

"*Note.*—Great care should be taken in drying the brickwork in new settings and benches. This should be done very gradually. At least two months drying should be given; more if possible. In heating up the setting care must be taken not to close the firing door of the generator until the nostril bricks of the arch over the generator are *red hot* so as to ignite the carbonic oxide gas as it issues from the generator into the combustion chamber. This is *most important*, for otherwise there would be *an explosion in the setting.*"

Mr. Littlehales said that 30 years ago he had been the manager of a gas works in England, since which time he had closely followed the workings of the English companies. It seemed to him rather remarkable that when the system of inclined retorts was being discussed the results obtained by Mr. Herring, at Edinburgh, did not by any means prove, in dollars and cents, the value of the inclined retorts; for it was shown by "Field's Analysis" for 1900 that 23 out of 35 of the principal British companies put gas in the holder cheaper than was done at Edinburgh. The best possible comparison was between Edinburgh and Glasgow, which works were but a few miles apart, and operated under practically the same conditions, although in Glasgow coal cost 34.32 cents per 1,000, and in Edinburgh 31.50 cents per 1,000. In Glasgow 17.06 cents was returned in residuals; in Edinburgh 11.10 cents. The cost of gas in the holder at Glasgow was 38.84 cents; in Edinburgh 39 cents. These were the results obtained by two neighbors, working side by side, the manager of one being the apostle of the inclined retort, the other using the horizontal; yet in the latter place they were 7 cents per 1,000 feet to the good. In Sheffield gas was put in the holder at a cost of 22.60 cents, as against 39 cents at Edinburgh. Comparing Edinburgh and Glasgow, the latter certainly has the advantage, and if inclines are as good as claimed this should be reversed.

Mr. Carroll Miller regretted that in some cases Mr. Brown had assumed the figures given, and that in other cases had not stated practical results. He thought the number of men assumed on the inclined relation to be rather high. He would like to ask Mr. Brown if any of the results stated by him were obtained from practical operation in gas works. The figures given by Mr. Egner also seemed theoretical, and he would like that Mr. Egner should, if possible, give a comprehensive comparison of figures obtained from actual working results and not from theoretical proposings, in order to show from such comparison the relative cost of coal and labor in the operation of horizontal and inclined retorts.

Mr. Egner replied that he intended to give only practical and not theoretical results and had made no comparative statements at this time. Some years ago he read a paper before the Association in which he had given a comparison of figures obtained from actual working results, but he could not now recall them.

Mr. Doty said that investigation in Detroit confirmed the conclusions reached at Milwaukee. As the result, Detroit was now building vertical retorts, with stoking machinery. He thought the construction cost as given by Mr. Brown was not understated.

Mr. Prichard called attention to the fact that all the figures given, as well as all the remarks made so far, related only to large works making about 4 million cubic feet per day. In works making only a million feet per day, part of which was water gas, or works making only one-half million feet per day, inclined retorts must be used to effect any reduction in the retort house labor. Starting with the fact that works of the size indicated can use inclines to advantage, and cannot use stoking machinery, you can draw two curves, very far apart at this point, but that gradually approach as the size of plant is increased. Whether they approach close enough to touch, or whether they cross, as Mr. Brown claims, is open to discussion and to experience. Mr. Prichard said that Mr. Brown's paper contained a number of statements with which he did not care to agree. The author had quoted the making of a bench of inclined 8's as 135,000 feet per day, but the guarantees now being put out by responsible builders of inclined retorts were very much more than that amount. In another statement by Mr. Brown only half the benches were working, yet the same amount for depreciation was charged off as if the full number of benches were in duty. To this he took exception. Mr. Brown stated that inclined retorts use an excessive amount of fuel; but he saw no reason why an inclined bench of 8's should use more fuel than a horizontal bench of 8's. Mr. Prichard did not think that inclined retorts were any more expensive to erect, figuring on the same capacity, as indicated by the figures quoted by Mr. Brown in Exhibit B. Nor were inclines more difficult to repair. The furnaces and arches being the same as with horizontals, there could be no more difficulty in repairing these parts of the one than of the other. The only difficulty came in the middle joint of the inclined retort, and that should not be a very serious matter. In case of a breakdown in machinery, Mr. Prichard thought the works would be just as badly off with horizontals as with inclines. He did not agree with Mr. Brown's statements that inclines gave a lower yield of gas per ton; that they depreciated the illuminating power; that they were uncertain in producing capacity; or that they were more trying to the workmen than were horizontals.

Mr. Doty said in his statement that he thought Mr. Brown's figures as to cost were not understated, he meant to say that those figures were not higher than were warranted by the actual facts. The benches in Detroit would cost slightly less than the figures named by Mr. Brown; and our American stoking machinery costs slightly less than the stoking machines adopted by Mr. Brown.

Mr. A. S. Miller commented on the fact that Mr. Brown had charged up 24,000 square feet of real estate at a much higher price than 25,000, and also made one coal bin cost more than twice as much as another coal bin of equal capacity. These might be due to local conditions, but would not usually obtain in practice. Mr. Brown had taken the yield per foot of the inclined retorts as given by foreign works, and compared it with the yield per foot of the horizontal retorts as obtained in American works. There was no reason why as much gas could not be made per foot with inclined retorts as with horizontals, and on this assumption Mr. Brown's own figures would show that it was very much cheaper to operate inclined than horizontal retorts.

Mr. A. H. Barret said that Mr. Brown's basis of comparison was probably a new one to many of the members, and a comparison of workings on his basis would have to be made in order to reach a satisfactory conclusion as to the accuracy of the results stated by him. He did not, however, see why there should be much complication about it. At Louisville, Ky., gangs of 4 men on a watch drew 216 charges per day. Taking 750-pound charges and 5-hour periods, we would get the labor per ton of coal carbonized.

The Secretary asked Mr. Barret to state the yield of gas per retort at Louisville. The yield per foot might not be as great in inclined as in horizontal retorts, for while theoretically there was no reason why the yield per foot obtained from a retort, 18 inches by 30 inches and 10 feet long, should not be greater than that obtained from a retort 16 inches by 26 inches and 9 feet long, in practice it did not seem to be greater.

Mr. Barret stated that the yield per inclined retort of the indicated size was about 18,000 feet, which was somewhat less per foot than the yield claimed by some for horizontals.

The Secretary further said he was still on the fence as to the advisability of using inclined retorts. He had not studied the subject thoroughly, and it was very hard to get reliable data. The demand in England at the present time was to get figures for both kinds of works, given on a common basis. A committee had been appointed by one of the Gas Associations there to devise some form of keeping and stating accounts which would permit accurate comparisons to be made of the cost of carbonizing at different works in the country. A gentleman whose judgment as a coal gas manufacturer was good, who had visited England frequently, and who had good opportunities for getting information, had stated the general sentiment among the best engineers in England at the present time to be that, for very large installations, there was practically very little difference between inclined and horizontal retorts—that when worked by good stoking machinery the advantage was possibly in favor of horizontals; but that for works of medium size inclines probably had the advantage. The speaker believed that if a bench of 8's, in two tiers, four high, could be worked in horizontals, but could not be worked in an inclined setting, then the horizontal would have the advantage at the start. There was no question that a bench of 9's or a bench of 8's, built three wide, if properly built and looked after, could be run with good results; but it was much easier to get good results from a bench with but two tiers of retorts than from one with three vertical tiers, for with only one combustion chamber room could be got there which could not be had for two without sacrificing space, and a roomy combustion chamber was the main thing to be looked out for in a regenerative setting. Without a roomy combustion chamber good results could not be obtained.

Mr. H. A. Carpenter said it seemed to him that the comparison between the relative merits of inclined and horizontal retorts was a very simple one, for if similar quantities were eliminated from either side of the equation the result would be definite and conclusive. Taking the basis upon which Mr. Barret had given information there were very few retort houses, equipped with any kind of stoking machinery, which could not do as well as the results stated by Mr. Barret. When those results were compared with what was done with the best grades of stoking machinery, the comparison became very striking. In the No. 4 retort house at Beckton, four men charge and draw in 24 hours the equivalent of 600 charges, of approximately the same weight as stated by Mr. Barret.

Mr. Rollin Norris asked for information as to the length of the retorts in the Brooklyn installation and the yield of gas per 24 hours, the length of the retorts mentioned by Mr. Barret and also the length of the retorts on which Mr. Brown based his figures at Milwaukee.

Mr. Nettleton said that, as he understood the conditions, the inference which had been drawn in the comparison between the works at Edinburgh and at Glasgow, in favor of machine-stoked, horizontal restorts, as against inclined retorts, was not warranted by the facts. While Mr. Herring firmly believed in inclined retorts and was now putting up what is probably the largest retort house in the world containing inclined retorts, which he hopes will have a daily capacity of 10 million feet, yet at the time of Mr. Nettleton's visit in 1890 he had in operation only two small benches of inclines, and it was from the results obtained from those two benches, after experimenting with them for over a year, that he determined the form for the incline settings and furnaces in the new retort bouse. So that, in the comparison between Glasgow and Edinburgh, it was machinery in Glasgow, but it was not inclines in Edinburgh. While abroad Mr. Nettleton had visited a great many gas works and came away with the impression that both systems were very good. Each system had its advantages and its disadvantages, but he was impressed by the fact that in the actual work of hauling the coke out and putting the coal in by machinery the men were further away from the fires, and their work, so far as the heat was concerned, was much less severe with the stoking machinery than with the inclined retorts.

President Beal expressed himself as being glad to see that there were in the Association men of radically different temperaments. Some of the members were willing to adopt new sorts of apparatus and to experiment for the benefit of all, whereas others, naturally conservative, were inclined to go ahead slowly. He hoped that, a year hence, after more experience, the advocates of inclined retorts would be able to make a showing as to their value fully as convincing as Mr. Brown's paper had been to the contrary.

Mr. Brown in reply said that he had no excuse to offer or apology to make for anything contained in his paper. He was satisfied that results would prove the correctness of his position. He did not agree with Mr. Egner that the fact of use justified the introduction of inclined retorts. He did not think that usage alone justified anything. A man might continue to go along in the same way to cover a mistake; he might be sorry, but not dare say so. Mr. Egner had said that the builders of Continental stations obtained their ideas from such comparisons as Mr. Drory had made; but Mr. Drory's results were of no use for comparison here for the reason that he had not compared modern installations of the two systems. He would take whatever Mr. Drory had said without question, for he believed every figure he had given was correct, and Mr. Drory's statements condemn inclines. He (Mr. Brown) wished to read the following extract from a letter, dated August 29th, received from Mr. Carpenter, of the South Metropolitan Company, of London, England, who had had as much experience as any other engineer mentioned by Mr. Egner: "I may say, in reply to your inquiry, that my Company have erected inclined retorts at three of their works, viz.: West Greenwich, Old Kent Road and Bankside. The settings and general arrangement at the former of the works were designed by Mr. J. F. Braidwood; those at the Old Kent Road works by my predecessor, the late Mr. Frank Livesey; and those at Bankside by myself. * * * I may say that the Old Kent Road installation was fitted up with the Shoubridge system of 'positive drop' charging appliances. We have had several years' working of inclined retorts, therefore, at different works, and under different engineers, and are now in a position to know something about their merits and demerits. When I tell you that it has been decided by the Board of Directors that the installation at this works, consisting of 150 20-foot retorts, shall be pulled down after having worked next winter, and the house converted to horizontal retorts and machinery, you will understand the direction in which our experience has guided us. Inclined retorts work very well if they can be supplied continuously with coal of the same character as regards its physical condition and qualities; that is to say, one can find out by experience the best arrangement suited to a certain coal, but if the character of this coal is departed from trouble, great waste and loss ensue. For the present at any rate, the remaining two installations shall continue, and the reason is that out of the upwards of nearly 1¼ million tons which we carbonize yearly, we are able to sort out sufficient coal of a suitable character for these two works, but in the case of a large works—like the Old Kent Road—this is impossible. Hence we have decided to 'take the bull by the horns,' write off our expenditure on 'inclines' and revert to 'horizontals.' You will ask why we put in 'inclines' in the first place. From what I have seen and from what I was told I was very favorably inclined to their use; indeed the installation at Bankside was put in upon my recommendation. The real difficulty seems to be in getting accurate information. The man who has spent 10,000, 20,000 or 30,000 pounds on an inclined bench is very loth to admit that it is in any degree a failure. I should particularly like you to read the paper which accompanied my description of the Bankside installation, which you will find in the 'Transactions of the Institution of Gas Engineers,' for 1900, Volume 10, for the reason that all the information I gave then no one can say it was biased in the least degree. Within the last twelve months, however, I have been con-

cerned with the patenting of some stoking machinery devices so that some who may not think with me now consider they have discovered a reason for the opinions I hold. At the time I speak of nothing of the kind existed in my mind. I have simply turned my thoughts to stoking machinery because I am convinced that therein lies the solution of the economical manufacture of gas from the retort system. Hoping this information may be of service to you in the preparation of your paper, I remain, Yours very truly, CHARLES CARPENTER."

Mr. Brown, continuing, said that although they were building inclines at Leeds, they could not get better results from the new works than they were getting from the old station at Wortley, which had been rebuilt and was now equipped with modern stoking machinery. Mr. Egner had claimed that in some installations the cost of stoking was decreased. The decrease of two pence per ton in the cost of stoking labor, claimed for some installations, was a mere bagatelle as compared with the fixed charges, maintenance, and depreciation. He had not quite followed Mr. Egner's quotation from Mr. Shoubridge's letter as to the labor account at the Crystal Palace District Gas Company, but believed the statement showed 50 per cent. more furnace fuel than is needed in a horizontal installation, and Mr. Shoubridge omitted to state any top men or pipe men, yet it would be surprising if in his works you would not occasionally find a gang of men jumping pipes. The notes quoted by Mr. Egner, in reference to the Bow Common station, must have been very carelessly taken as he had in his hand a letter from Mr. Goulden, of the Gas Light and Coke Company, stating that Mr. Egner's statements in regard to Bow Common are "Incorrect in every particular, as is also that which gives an advantage to the inclined retort system on account of the saving in the up-keep of the settings." Mr. Goulden went on: "The fact is that the verdict of for or against one system or the other must be decided by the consideration of local conditions and not by the superexcellence of one system over the other." Replying to Mr. Prichard's question as to where the curves would cross, as the size of plant was decreased from a 4-million to a 1-million plant, and so on down, or where they would be at zero, he could not agree with Mr. Prichard as to just where the crossing would be; although he might agree with him if he were to figure the size of the plant small enough. He had based his problem on a plant making 8 million feet per day, and he did not know of any installation which was doing more than he had allowed. Taking 135,000 cubic feet per day, per bench of 8's, as the maximum working capacity of the inclines, he could count on getting that, or a little more, at Milwaukee. Taking that figure and simply changing the wage and cost factors for other works would not change the relative position at all. If the cost of depreciation were greater for inclined than for horizontal retorts, it would make the showing slightly better for the inclines; but the difference was immaterial. The question of heating the vast contents of an inclined bench uniformly, and keeping it at a proper temperature economically, was a very serious one. It could only be done at a large expense for fuel. Replying to Mr. Prichard's suggestion that inclined retorts were no more difficult to repair than were horizontals, Mr. Brown said that one who had tried to repair 10-foot retorts, and had to put patches in the seats of them, might not think it very difficult; but when the retorts were 20 feet long, and inclined at an angle of 32°, and an attempt was made to patch them from below, getting on one's knees to do it, or to patch them from the top and have the hot air and gases come into one's face, it became a little more difficult. As to charging the retorts when the machinery failed, he agreed with Mr. Prichard that if the machinery broke down entirely it would not be possible to charge all the retorts of a 4 million feet per day house by hand. The charging and discharging machinery used with horizontals might break down, and so might the coal handling machinery with inclines. In this country horizontal machinery was always provided in duplicate; abroad they did not use spare machinery with inclines. In case of a breakdown with inclines the retorts could not be fed by hand for two or three days while the machinery was being repaired; with horizontals it would still be possible to work some of the benches while repairs were being made. The high price paid for real estate, and the expensive coal bin criticized by Mr. Miller, were both due to local conditions, which, if eliminated from the comparison, the cost as between the two houses would be the same. Regarding the basis of comparison used on the other side, Mr. Brown said that, although Mr. Herring had done excellent work in the direction of uniformity, he had simply figured on obtaining from the inclined retorts just as good work with the same coal as the horizontals were doing, and was putting the labor on the inclined retorts below that of the horizontals. In the construction of the Milwaukee plant there had been neither time nor money for experiment. It was necessary to start with something that was right, the work had to be done; the company could not wait for experiment, nor could it afford to put up works of that size as an experiment.

REPORT OF COMMITTEE ON PRESIDENT'S ADDRESS.

Mr. Doty read the following report of the Committee on President's Address, which was received and placed on file:

Your Committee on President's Address desires to congratulate the Association upon the opportunity presented to them to combine in one meeting a visit to New York, with its wealth of information and beauty, and an address so full of dignity and thoughtful consideration of the welfare of our industry. To make the most of the opportunities so freely given is a duty for the members of the Association, and a thoughtful individual review of the address is suggested.

We believe that the governing authorities of municipalities must be brought to a realizing sense of the importance of conserving vested rights, and the surest way to win public favor is to deserve it. The identity of interest idea must pervade both the public and the company. If it be necessary to tax franchises for the purpose of increasing public revenue and to consider franchises as property, then property rights must be acquired by franchises, and the cities are in duty bound to conserve the right so acquired by affording protection against unprincipled raiders whose sole motive too often is of selfish interest.

The last word cannot be said in the present state of the art on the subject of inclined retorts. An honest difference of opinion may exist as to the merits of inclined retorts, but the opinion of your President must carry the weight of successful experiences.

The strike in the anthracite region, and the consequent shortage in the supply of anthracite coal, brings forcibly to mind the necessity of the possession of a combined coal gas and water gas plant. The duty of providing for the continuity of the gas supply is incumbent upon the owners and operators of gas properties, and a state of preparedness brings relief from anxiety and stress.

The coke oven process for gas making is well worthy of investigation, and the possession of a coke oven plant is added security for your property.

The advantages of centralized control and management of gas companies are reflected by the success of such ownership of the properties.

An ideal condition of society does not exist to-day, and the millenium is still distant, so that municipal ownership of public service utilities is not recommended. The committee desires to express the opinion that the terms "ownership" and "control" are not synonymous. A brotherly relation should exist between investment and capitalization. Blood is thicker than water.

We believe that the importance of full information upon the relation of municipalities to gas companies is worthy the appointment of a committee, and we advise that the President's recommendation of the appointment of a committee of five be adopted.

To secure equitable methods of taxation would approach an ideal condition. Who shall say what is the true cash value of your property, and how shall he reach such conclusion?

There is no real mystery surrounding the gas industry, and why there should be an apparent mystery we leave to the individual members.

The part of this able address devoted to possible means of securing the adequate and just public safeguarding of the invested properties committed to our charge is deserving of our most serious consideration. In order to secure to ourselves in our hazardous enterprises an assured earning capacity equal to that received from the conservative management of other lines of business, it is indeed necessary, as the President so well says, to treat the public fairly and generously, at the same time organizing ourselves into State Associations so directed that adequate legislation may be secured—a legislation which will give stability to our securities, protect all investors and guarantee the public against wasteful, expensive competition that in the end works for high rates. The suggestion of the President to organize State Gas Commissions as a protection to both investor and the public is a matter pressing upon the attention of gas managers, especially in some of the States.

The time has passed for a conflict of interest between gas and electric properties. The field is big enough for us all, and as gas engineers we cannot afford to be in ignorance of the work of our electric brethren. Gas is a form of energy that can be converted into light, heat and power; electrical energy can be converted into light, heat and power, and we, as engineers, the conservators of energy, must become energy engineers, and bring gas and electricity hand in hand. We believe there is an opportunity to increase the use of gas for street lighting purposes, and the field should be cultivated and not abandoned to the electric arc light.

We concur in the expression of the value of the educational work

undertaken by the Association, and believe it should be supported and continued.

We believe that the damage due to stray electric currents is so great and the need so urgent that the recommendation of your President to appoint a committee on electrolysis should be adopted. Individual companies, we believe, should co-operate with the street railway companies, having in mind due regard for mutual interests.

Respectfully submitted, PAUL DOTY, Chairman, FRED. B. WHEELER, IRVIN BUTTERWORTH, } Committee.

The President introduced Mr. W. Cullen Morris, of Ravenswood, L. I., who read the following short topic entitled

A TEST OF A HIGH POWER INCANDESCENT GAS LAMP.

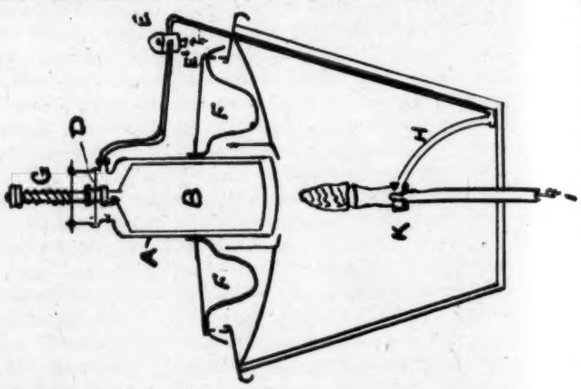
In bringing this subject before you I do not wish you to think me an advocate of high intensity light units, except where the consumer may demand such a unit, or competition with electricity warrants the placing of high power units to supplant arcs for street or store lighting. For purposes where it is necessary that lights should be at levels approximately that of the eye it is questionable whether hygienic objections are not strong enough to prevent their use.

European technical papers have from time to time contained accounts of various high pressure, incandescent gas lamp systems, and in all cases the results obtained have been most satisfactory; but the methods adopted for producing the pressure have, in most cases, been cumbersome and difficult of application, except in special situations, causing the system to lose its value for general use.

Among the several lamps on the market, that of Mr. Scott-Snell attracted attention, and at my request the manufacturers furnished me with two lamps for experimental work. The results of a series of tests, more or less complete, on these two lamps are the substance of this paper, and I regret that the shortness of time between the arrival of the lamps in this country and the date of this meeting prevented the obtaining of more complete data.

The burner used in the lamp is an ordinary No. 4 Kern burner, with a No. 4 Kern Bunsen tube, provided with a special check for admitting the gas direct from the main, and air or gas according to the type of lamp (whether air or gas compressing) from a small chamber connecting with the compressing apparatus, which is located over the frame of the burner in the crown of the lamp frame. This compressor consists of a chamber 12 or 13 inches high and 4 or 5 inches in diameter, containing a loose fitting displacer about 10 inches high, having a stem connected to a flexible diaphragm and a set of springs. Into the top of the chamber a pipe connecting with the gas supply, or open to the atmosphere according to the style of lamp (gas, compressing or air-compressing), admits air or gas through a check valve, and also through another check valve communicates with the pressure orifices on the burner. Following the operation of the air-compressing lamp the expansion of the air under the displacer, and the cooling of this volume when the displacer is up, causes a movement similar to that of a hot air engine. Compession takes place and the check valves allow air to be drawn in and the air under pressure to be expelled. In the early types of this lamp the displacer chamber was air cooled, but in the present type it is cooled by radiation alone.

The following sketch (A) of the lamp will make the above explanation clearer.



Sketch A

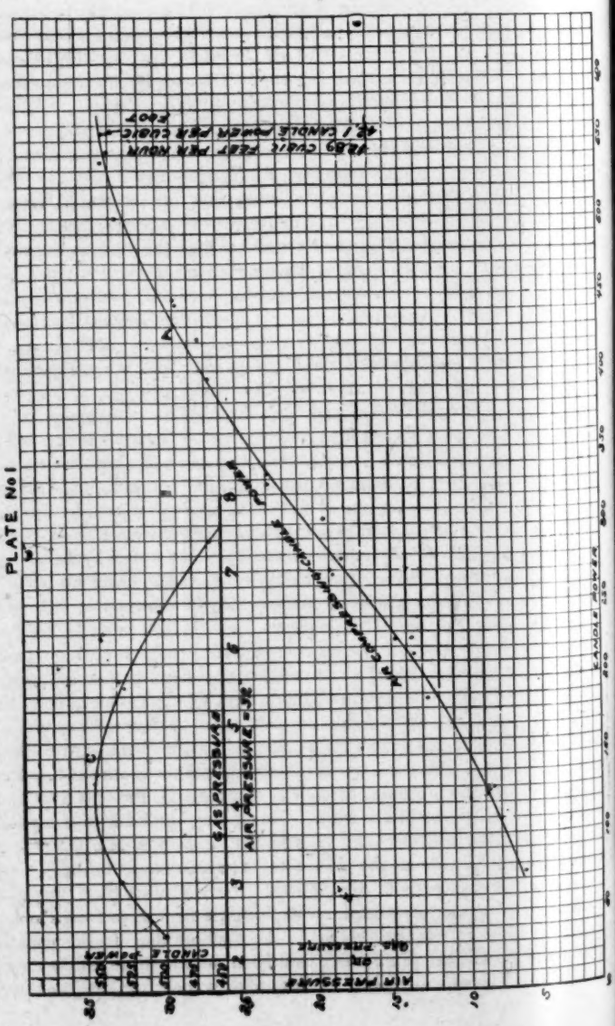
A Body
B Diaphragm
D Check Valve
E Air Inlet
E' Air Reservoir
F Spring
G Tube
H Gas Inlet
K Combustion Nipple

The tests were made on a 55-foot photometer bar, consisting of a gallery extension to one of the photometer rooms. This gallery was made of a 4-foot square frame covered with black paper. Sharp edged screens were placed at such intervals in the length of the gallery that, for any position of the sight box necessary in the course of the test, light could not be reflected from the sides of the gallery to the sight box. The standard of light used consisted of 2 Sugg, D-Argand burners, with Edgerton screens, placed close together. It was assumed that the photometric center of this group corresponded to that of a single burner; that is, $\frac{1}{16}$ of an inch in advance of the geometric center.

The tests of the air-compsessing lamp included the determination of the candle power for several pressures of air in the air chambers, the gas pressure being maintained constant; a determination of the candle power for several gas pressures on the burner, the air pressure in the air chamber being maintained constant.

Table No. 1 gives a set of results obtained on the air compressing lamp, with the gas pressure maintained at the pressure for which the gas check was designed, and the air pressure varied over a considerable range, accomplished by inserting a governor beyond the compressor.

Table No. 2 gives the results of a test on the air compressing lamp with the compressor working at 32 inches for several pressures of gas.



In this test the intention was to determine for the burner tested the effect of changing street pressure.

Plate 1, Curves *A* and *C*, show graphically these results.

Plate 2, Curve *D*, shows the candles per cubic foot, plotted against air pressure.

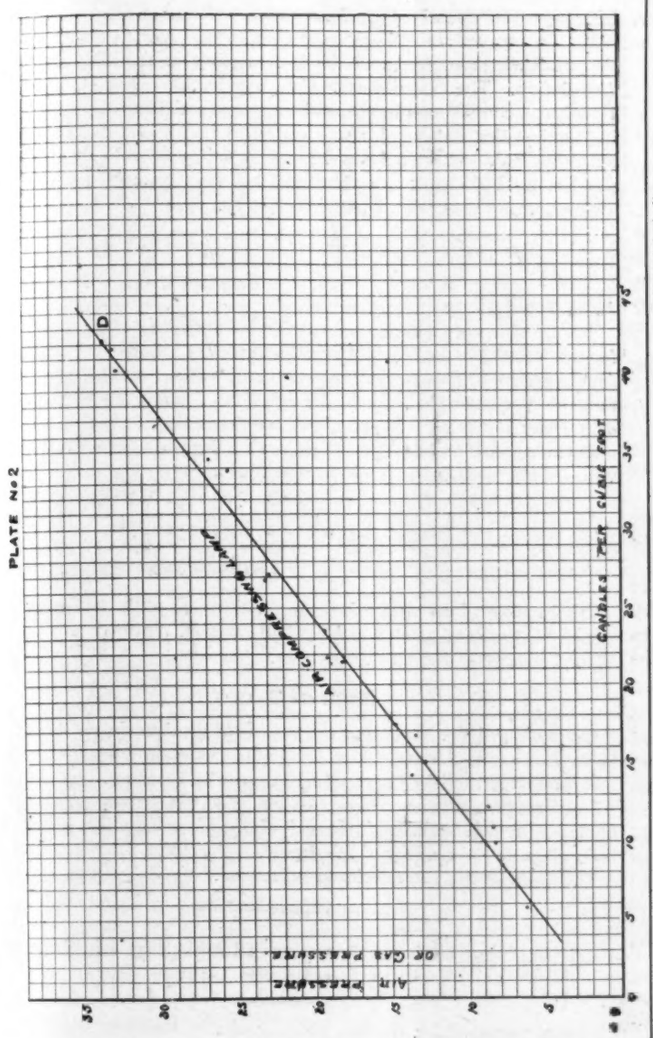


TABLE No. 1.—*Air compressor lamp; No. 4 Kern Bunsen; No. 4 perforated core; No. 4 Kern cone; serrated spreader with fifteen .07-inch holes; check, one .07-inch gas hole; two .022-inch air holes; kind of gas, 25-candle power water gas.*

Test No.	Gas Pressure, Inches Water.	Air Pressure, Inches Water.	Cubic Feet Corrected to 60° F.	Total Candle Power.	Candles per Cubic ft. Gas, at 60° F.
1.....	2.3	33.5	12.9	544.3	42.1
	2.3	25.4	12.9	436.3	33.8
	2.3	18.2	12.9	277.7	21.5
	2.3	14.9	19.9	225.5	17.4
	2.3	8.8	12.9	129.2	12.1
	2.3	6.3	12.9	75.0	5.8
2.....	2.3	33.0	12.9	541.0	41.9
	2.3	19.2	12.9	301.8	23.3
	2.3	13.4	12.9	215.6	16.7
	2.3	8.0	12.9	110.7	8.5
3.....	2.3	32.8	12.4	498.8	40.2
	2.8	29.0	11.5	444.4	38.2
	2.3	26.9	11.5	395.0	34.6
	2.3	23.1	12.4	332.9	26.8
	2.3	19.3	12.4	270.0	21.7
	2.3	13.6	12.4	178.2	14.3
	2.3	8.2	11.9	130.0	10 0
4.....	2.3	33.5	12.9	544.3	42.1
	2.3	22.9	12.4	337.2	27.1
	2.3	19.0	12.4	267.8	21.5
	2.3	12.8	12.4	186.4	15.0
	2.3	8.4	11.9	130.0	10.9

TABLE No. 2.

Test No.	Gas Pressure Inches Water.	Air Pressure Inches Water.	Cubic Feet Gas, Corrected to 60° F.	Total Candle Power.	Candles per Cubic ft. Gas, at 60° F.
5.....	2.3	32.0	12.5	475.0	38.0
	3.0	32.0	13.0	536.0	41.3
	4.3	32.0	13.0	555.0	42.8
	5.5	32.0	14.5	528.0	36.5
	6.5	32.0	17.0	502.0	29.5
	7.4	32.0	19.0	459.0	24.0
6.....	4.4	32.0	13.5	553.0	41.0
	5.7	32.0	15.0	543.0	36.2
	6.4	32.0	16.5	499.0	30.3
	7.4	32.0	19.0	458.0	24.0

In the case of the gas compressing lamp the check valves are so arranged that after the pressure begins to build up all the gas passes to the compressor and then to the burner. The results of the test on this lamp are given in Table No. 3, and are shown graphically in Plate No. 1, Curve *B*. Plate No. 3, Curve *E*, shows the candles per cubic foot plotted against gas pressure.

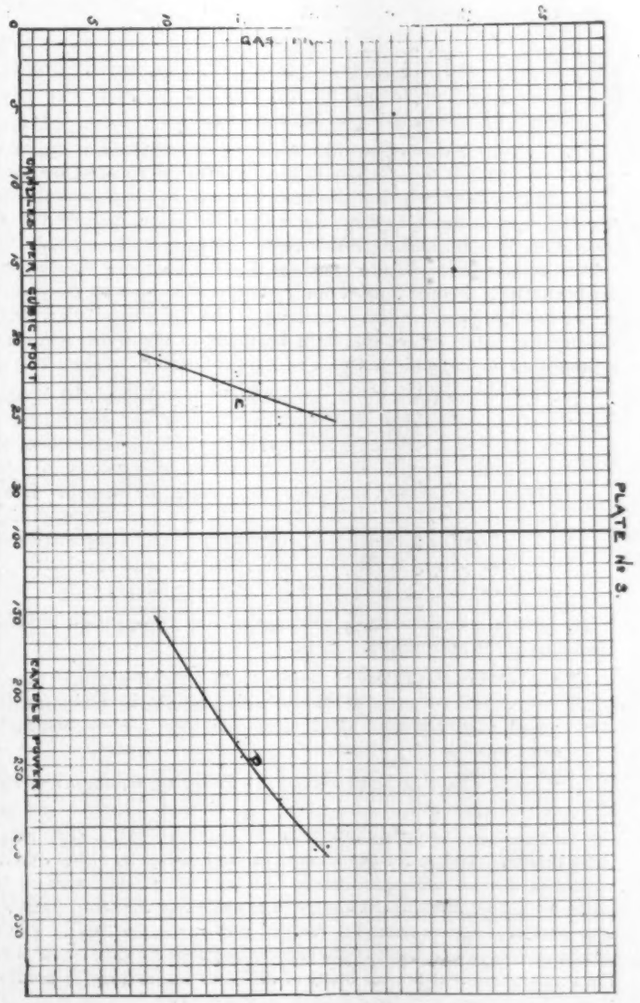


TABLE No. 3.—*Gas compressor lamp; No. 4 Kern Bunsen; No. 4 perforated core; No. 4 Kern cone; serrated spreader, with 15 .07 inch holes; check, 4 gas holes, .023 inches; kind of gas, 25-candle power water gas.*

Test No.	Gas Pressure on Main.	Pressure of Gas on Burner.	Cubic feet gas, Corrected to 60° F.	Total Candle Power.	Candle Power per Cubic ft. Gas, at 60° F.
7.....	2.4	20.3	12.0	302.8	25.2
	2.4	17.1	11.0	277.7	25.3
	2.4	14.5	10.7	245.5	22.8
	2.4	9.2	7.6	162.0	21.2
8....	2.4	19.5	12.1	306.3	25.3
	2.4	17.1	10.6	276.5	26.0
	2.4	14.3	10.4	233.9	22.5
	2.4	9.0	7.1	157.3	22.1

Before closing I would say that for various reasons the manufac-

turers have ceased making the gas compressing lamp. One important objection was the tendency of the lamp to gum up, so causing the compressor to cease working. The air compressing lamp seems to be successful, although I have not had it long enough to determine its lasting qualities. The mechanism, however, is simple and should not easily get out of order.

In closing I wish to express my thanks to Mr. P. L. Wormsley, M.E., and to Mr. C. C. Atwood, M.E., who made the tests, and to the manufacturers of the lamp for their courtesy.

THE QUESTION BOX

was then taken up, as follows:

No. 1.—"Would it add greatly to the cost of gas ranges to have them fitted with leveling screws?"

Mr. W. H. Crane said that such fitting would add to the cost possibly 20 or 25 cents for each range. A simple way of doing it would be to put a boss at the end of the foot, making a solid place for a hole, drilling and tapping the same, and have a flattened, ball-shaped setscrew to raise or lower as required.

No. 2.—"Given, a well made coal gas of 18-candle power and an equally well made water gas of 18-candle power, each to be burned in such burners as will best suit the particular kind of gas used, which will give the more light?"

Mr. Walton Clark said he did not see any difference between the two gases when each was consumed at the same rate of burning per hour.

Mr. McDonald inquired if the answer would be the same if the question had been as to which gave the more satisfaction, taking into consideration the color and the diffusive power of the light.

The Secretary thought the coal gas would give more satisfaction to the consumer. People judged of a gas flame not alone by the light but somewhat by its appearance; and while the light obtained would be exactly the same, objection might be made to the water gas on the ground that its flame did not look as well as the flame of the coal gas.

No. 3.—"In a town of 10,000 to 30,000 population will it pay to make periodical inspections of gas burners and appliances, and to attend to small leaks, removal of tips and minor troubles, free? This work also to include the care and maintenance of Welsbach burners at a fixed, but moderate, charge per month? If such periodical inspection is not advisable for a gas company, would it be advisable for a company controlling both a gas and an electric light plant, where periodical visits are made to electric light consumers for the purpose of renewing the lamps?"

Mr. Butterworth thought all were agreed that the question should be answered in the affirmative.

No. 4.—"What are the advantages and disadvantages of connecting consumers meters entirely with wrought iron pipe as compared with the method of using lead pipe connections for the same purpose?"

The Secretary said he had received the following communication relating to this question:

"This question probably refers to the smaller sized meters, that is, those under 20 lights, for the wisdom of connecting 20 lights and over with iron is no longer questioned. All iron for small meters as compared with lead has the advantage of slightly less first cost, longer life and greater freedom from interrupted service due to kinks. The disadvantages of all iron connections are the greater difficulty in changing meters, different makes being of different size and the iron connections allowing no give and take, and the danger that in making the connection the fitter may strain the meter. This danger is greater in very large companies than it is in small ones, where each meter man is better known, and there is less chance for an unskilful man to get temporary employment. As a compromise between all iron and all lead, we, in Philadelphia, use lead outlet connections, there being 10 inches of lead in the connection. There is enough give in the lead to relieve the meter of any strain. We permit a slight bending only and are not troubled with kinks."

The Secretary added that he thought the objection there stated, that the iron connections allowed no give or take, was met in some cases by putting in a swing joint in the iron connection which would allow a couple of inches play without changing the connection. These connections were largely used by some of the Western companies.

Mr. Searle said that the most important advantage of iron connections was the first cost, having reference to both labor and material. Another advantage was that iron connections did not require the same degree of skill in the workman.

Mr. Norris agreed with Mr. Searle that the iron connections were a little cheaper than lead. The trend of practice was more and more towards the use of iron connections for all large meters, and to a great extent for smaller ones. Some companies used all iron connections for inlet pipes and short lead connections for outlets.

Mr. Butterworth said there was a complete answer to the question in the published proceedings of the last meeting of the Ohio Gas Light Association. The Natural Gas Company in Columbus, O., had about 16,000 iron connections in use, and with great satisfaction, notwithstanding the fact that natural gas was distributed at much higher pressure than artificial, and the leaks were not so noticeable because of natural gas having little odor. In Denver, Col., iron connections were used altogether and were found very satisfactory.

REPORT OF COMMITTEE ON AWARD OF BEAL MEDAL.

NEW YORK, Oct. 16, 1902.

A. E. FORSTALL, Secy., etc., etc.:

The Committee appointed to consider the awarding of the Beal Medal for the meeting of 1901 would report: That the papers read at the last meeting were of considerable interest and value. The Committee feel that the medal should only be awarded for a paper showing marked originality and of exceptional merit, the Committee, therefore, have not made an award, and feel that in so acting they best preserve the true value of the medal. Respectfully,

C. J. R. HUMPHREYS, Chairman.

On motion, the report was received and placed on file.

APPOINTMENT OF COMMITTEE ON AWARD OF BEAL MEDAL, 1902.

The President here announced the appointment of the following Committee on Award of Beal Medal for 1902: Messrs. Walton Clark, C. J. R. Humphreys and Charles H. Nettleton.

VOTES OF THANKS.

On motion of Mr. Nettleton, the thanks of the Association were voted to the President, Secretary and Committee of Arrangements for what they had done to make the meeting so much of a success.

The President expressed his appreciation of the prompt and large attendance at each of the sessions, and of the close attention which had been given to the reading of the papers.

The meeting was then declared adjourned.

Further Suggestions for the Elimination of Naphthaline from Coal Gas.

[A paper prepared for the last meeting of the Southern District Association of Gas Engineers and Managers, by MR. THOMAS GLOVER, of Norwich, and MR. WILLIAM YOUNG, of Peebles.]

The object of the present paper is to bring before your notice some considerations of the naphthaline problem which we believe have hitherto escaped notice, and to supplement the work already done by the authors of this paper and others, in proposing modifications in the methods of condensation which will effectually reduce the quantity of naphthaline in the finished gas.

In doing this, it should be first stated that it is not intended to modify our views in any way—either as to the necessity of treating naphthaline as a troublesome impurity, or that the most rational way to remove it is by the application of suitable solvents.

It is fairly generally acknowledged that the elimination of naphthaline vapor from the gas may be successfully accomplised by the methods first published in a paper read before the Gas Institute, in 1897, and since amplified in subsequent papers read before the two Institutes representing the gas industry in this country.

While it is gratifying to note this acknowledgment, it is a significant fact that by far the most numerous applications of the processes proposed and described have been made in Germany; but it is probably characteristic of the diverse views on works' management in the two countries. In Germany there is an abundance of skilled assistance for the examination of, and experimenting with, new processes. In England, any departure from proved methods is viewed with extreme caution—due to the fact that the manager, with varied responsibilities of office pressing on him, is unable to concentrate on to one subject the time necessary for its solution, and skilled assistants who are willing to

work for small pay are practically unknown in this country. The stringency of British laws affecting gas supply are also responsible for some of this reluctance to experiment. This partly explains the seeming paradox of loud calls for relief from naphthaline troubles on one hand and the non-adoption of an acknowledged remedy on the other. A further explanation lies in the fact that certain works using ordinary coals under apparently normal conditions are reported free from trouble while neighboring works with similar coals and conditions are never long free from troublesome stoppages.

The result on the minds of many gas engineers is a persistent hope that the crude gas may yet be found to contain within itself that which, by suitable treatment, may act upon the naphthaline vapor and insure its removal—so avoiding the introduction from the tar distiller of oils for washing. The drawbacks attending the use of washing oils have, we believe, been unduly magnified; but the desire to make the crude gas purify itself of naphthaline vapor is appreciated by us, and an attempt will be made to show one way in which this may be done. In the paper read in 1897 (to which reference has been made) it was our aim to clearly show that the remedy for the troubles arising from naphthaline was to be found in a sound application of the laws affecting the tensions of hydrocarbon vapors in crude gas and the solvent affinity of condensed liquid hydrocarbons for the vapors diffused through the gas. There is a variety of methods in which these principles may be applied in the process of gas manufacture and distribution. One of great interest calls for some attention before passing on—viz., Dr. Harold G. Colman's centrifugal separator. It will be necessary also to touch upon Mr. Carpenter's reversible condenser.

With regard to Dr. Colman's valuable contribution published in the *Journal of Gas Lighting*, of 3d June, I think we must all admit that he has given a most lucid description of the physical changes occurring during the passage of the gas from the retort to the terminal end of the condenser. His original proposal, to employ a centrifugal separator in order to give full effect to the solvent action of the light oils on napthaline vapor at the terminal of the condenser, is one that we can understand and appreciate. The weak part of the proposal, so far as the absorption of naphthaline is concerned, is the absence of light oil vapors (especially where Durham coals are used at high temperatures) in sufficient quantity for the purpose. If proof were wanting of this fact, other than the results obtained by distilling the tar, we have it in the conditions obtaining in the reversible condenser, where the rate of condensation is accelerated by water cooling, and where the reversals are necessary to prevent blocking with undissolved naphthaline deposits. Moreover, it may be questioned if it is advisable to withdraw at a temperature of 140° F., or thereabouts, even the heavy portion of the condensable liquid hydrocarbons, as they are practically free from naphthaline at that temperature, and their subsequent solvent action would be prevented by separation and removal.

For the extraction of naphthaline from gas, Dr. Colman emphasizes the useful part played by solvents. Mr. Carpenter, on the other hand, provides what are practically depositing chambers with cooled walls; the walls being washed down to remove the crystalline deposits by making the terminal end (where the deposits have taken place) into the inlet after the Sunday stop. The quantity of naphthaline, as ascertained by chemical tests in the finished gas, when compared with the actual weight of crystalline solid deposited in the long connecting mains to the station meters and holders at another works, shows results very much in favor of the reversible condenser. It would be presumptuous to criticize any efficient form of apparatus or method of working such as Mr. Carpenter described, which has given relief from an unmitigated nuisance of regularly recurring back pressure of from 5 feet to 6 feet; but it is difficult for an outsider to understand how, at the time deposits are being made in the last limb of the condenser, and for some time before a reverse is made, the gas can be leaving in anything but a saturated condition and ready to deposit crystals in the attenuated mains and services at low temperatures.

Both Dr Colman's and Mr. Carpenter's papers serve to emphasize the fact that, under modern conditions of carbonization, the proportion of condensable solvents present in crude gas is not sufficient for the absorption of the large volume of naphthaline vapor produced, unless resort is made to special treatment. When coals were carbonized at more moderate temperatures, and when enriching cannels were used, the tar produced was much larger in amount, and the volatile hydrocarbons were present in such quantities as to nearly saturate the gas. Precautions had then to be taken that the temperatures and other conditions during condensation were such as to prevent the absorption of benzol and other volatile hydrocarbon vapors with which the gas was nearly saturated. Hence the practice (to which under the *régime* of high temperatures too much value has been attached) of drawing off the thick tars at frequent intervals in the retort house. Under these old conditions no trouble was experienced with naphthaline, because it was not produced in such large quantities, and there was an abundance of hydrocarbons deposited in the condensers to take it up in solution or to simultaneously condense with it and carry it to the drip pots if deposited in the mains.

With high temperatures a considerable proportion of the vapors which under lower temperatures would ultimately condense as tar are cracked up, mainly into permanent gases—as carbonic oxide, hydrogen or marsh gas, and into the stable hydrocarbons—as benzol and naphthaline. The permanent gases are, therefore, much larger in volume and capable of taking up and holding in diffusion a large volume of vapor. The denser tars are smaller in quantity, and, therefore, less able to dissolve out of the gas the vapors of the hydrocarbons diffused through it. Not only so, but the nature of the hydrocarbon vapors predominating in the gas have been changed in character, being converted into naphthaline and the very volatile benzol—those of medium vapor tension being present in comparatively trifling quantities. These altered conditions account for the increased troubles from the presence of naphthaline, the naphthaline being produced in larger quantities, and there being a diminished production of solvent tars to take it up in solution. And, further, the hydrocarbon vapors with a higher tension than naphthaline being smaller, the increased volume of gas is less saturated by them, and the gas is in consequence capable of taking up and retaining in diffusion during the process of condensation an increased quantity of naphthaline. Or, to state it in another way, the larger volume of gas and the proportionately smaller volume of volatile vapors (these being mainly the vapors of benzol) and the smaller production of solvent tars, place, so to speak, a wider gap between the saturation point of the gas and the tars. That is to say, if the gas were brought into contact with a tar containing a large percentage of hydrocarbon vapors such as benzol, the unsaturated gas would take up in diffusion a portion of such benzol vapor; and, on the other hand, if the tar was brought into intimate contact with gas more highly charged with benzol vapors, the tars would dissolve out of the gas a part of such vapor.

That comparatively unsaturated condition of the gas and tars is undoubtedly the balance between the solvent affinity of the tars for the vapor and the tension of the vapor dissolved through the gas to overcome that affinity; but such conditions allow of a considerable range of temperatures being applied during the process of condensation without seriously affecting the vapors left in the gas, and consequently its illuminating power. This point is beautifully illustrated in the process of washing the gas to absorb the naphthaline by heavy tar oils. If the tar oils were applied to the gas just as they had been got by fractional distillation, they would not only absorb the naphthaline, but also the benzol out of the gas, and would continue doing so till the solvent power of the oil for the naphthaline and the benzol was balanced by the vapor tension of the naphthaline and the benzol to remain in diffusion through the gas. The object, however, is to dissolve the naphthaline only; and, therefore, in order to saturate the oil to balance its solvent affinity for the benzol, it has been found necessary to add to the tar oil from 3 to 5 per cent. of benzol, dependent upon the quality of the gas and the temperature at which the gas is being treated. If the gas had been near the point of saturation there would have had to be added a much larger percentage of benzol to bring about a balance.

In this process we have a measure of the solvent affinities of the dense liquid hydrocarbons present in the tars when presented to the gas so as to exercise their full solvent power upon the illuminants in the gas, and from which we may fairly calculate what would be the consequence of so conducting the process of condensation as to allow the tars to exercise their full solvent power upon the vapors present in the products that were suitable to increase the illuminating power of the gas. Let us assume that there will be produced from a ton of coal carbonized at high temperatures 10 gallons of tar, and that the tar contains 5 gallons dense liquid hydrocarbons whose solvent affinity for the volatile vapor had to be balanced to that of the gas to hold them in diffusion. Taking 5 per cent. of liquefied vapor or naphtha as the quantity required to effect such balance, that would be represented by 0.25 gallon of naphtha as the total possible quantity of vapors or illuminants that would be absorbed under ordinary temperature conditions by the dense hydrocarbons present in the tars from a ton of coal, even if the whole tars and gases were allowed to cool in intimate contact with each other. That is assuming, however, that the dense hydrocarbons were pure; but it has to be remembered that, under the best systems of condensation, the tars do manage to dissolve out of the gas volatile vapors equivalent to about 1 per cent. of the volume of the tars. This would nearly reduce the solvent power of the dense tars by one-half. Besides this we have to keep

in mind that the dense tars hold in solution about 12 pounds of solid naphthaline, or about 2 pounds of naphthaline per gallon of solvent, which will still further reduce their solvent power. Thus it may be safely assumed that not more than one-tenth of a gallon of benzol will represent the total possible loss in illuminants per ton of coal carbonized that would result from any method of condensation, even if the solvent affinity of the dense tars were allowed full play at ordinary temperatures, or equivalent in value at most to 0.25 candle or about 2 cents per ton of coal.

These assumptions are based on well ascertained facts, which have been fully supported by practical experience. The fractional distillation and separation of the constituents of the tars show that each gallon of liquid hydrocarbons present in such tars must hold in solution about 2 pounds of naphthaline; and even pure gas passed over such a solution would take up naphthaline vapors in diffusion. This fact would indicate that, even with the systems of condensation in which the gas and tars are allowed to cool in contact with each other, the gas will still, under modern conditions of carbonizing at high temperatures, be liable to contain naphthaline, and that if the naphthaline is to be successfully removed from the gas during the condensing process by the small quantity of liquid hydrocarbons simultaneously produced from the coal, these liquid products must be applied in some improved manner, so that their solvent power may be exercised to more advantage than our present methods allow.

A study of these conditions has led us to consider an improved system of condensation, the broad lines of which I will endeavor to indicate. The process consists in collecting the denser tars from the gases while they are still warm and holding in diffusion a considerable proportion of the high tension hydrocarbon vapors capable of being removed from the gas by condensation and solution. This is accomplished by collecting the tars deposited in the foul main while still hot, and fixing in any convenient position upon the foul gas main a Pélouze and Adouin tar extractor or the separator suggested by Dr. Colman, by which the liquefied particles suspended in the gas may be precipitated and collected. The separated tars are passed, by gravitation, to a cooling and settling tank, whence (having parted with the ammoniacal liquor) the cooled tar is passed into a combined condensing and washing arrangement, of any convenient form, by which the tars can be brought into intimate contact with the gas—the hot gas and the cold tar being made to flow in opposite directions.

The cooled tars, having been removed from the gas while warm, are comparatively free from naphthaline, and possess practically their full solvent power. Also—being thus applied fractionally, by being passed in among the cooled gas, and flowing back against the advancing current—they will, for well understood reasons, exercise their maximum cooling and washing effect, besides carrying away the naphthaline as it is deposited. The tar being gradually heated, as it flows back against the current of warm gas, gives up the more volatile of the hydrocarbons it has absorbed in the cold end of the condenser washer, while the temperature is not sufficiently high to cause the revolatilization of the absorbed naphthaline, or, if so, only to be subsequently reabsorbed by the less saturated tars. The tars are thus not only employed to exercise their maximum solvent power for the naphthaline, but they would in turn be subjected to a distilling process, to recover and retain in the gas the more volatile vapors. There would be the further advantage of employing the tars in this manner that, being applied in the final stages of condensation, their temperatures might be conveniently regulated to that which is found suitable to give the best results.

In conclusion, may I explain that it is not intended to suggest the use of very dense tar as a condensing and washing liquid which might have more of the characteristics of medium soft pitch than fluid tar, but the line of reasoning sketched for you leads us to hope that, by separating and precipitating the tarry particles at a high temperature when there is only a feeble affinity for naphthaline, a suitable fluid may be obtained from the crude gas itself to assist in condensation and the removal of the naphthaline vapor.

Will the members of this Association accept this as a small and imperfect contribution to the elucidation of a perplexing question? Whatever may be the fate of any proposals for altered methods of working which may be made from time to time, the knowledge of natural laws underlying the processes we employ has a permanent value, and only by a true understanding and appreciation of those laws may we hope at last to be freed from the trouble incurred through deposits of naphthaline.

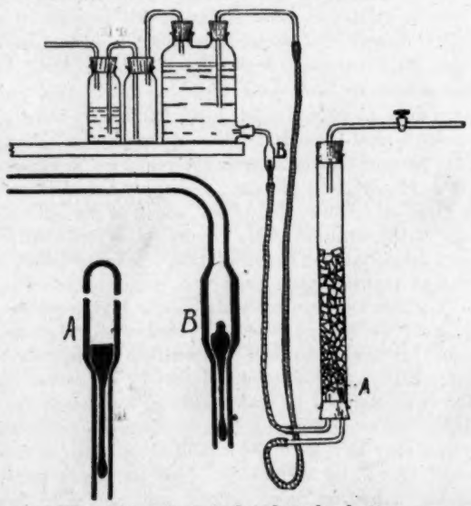
THE South Jersey Gas, Electric and Traction Company is piping the town of Florence, N. J., for a gas supply.

An Automatic Laboratory Gas Generator.

To the last issue of the *Jour. Amer. Chem. Society*, Mr. H. H. Denham of the Buffalo (N. Y.) Central High School contributes the following:

In the course of some experimental work recently begun the writer was confronted with the want of an automatic gas generator which would yield at least a moderately steady supply of hydrogen sulphide without the necessity of frequent manipulation. As is well known, the Kipp and other forms of gas generators in common use have the defect of using over and over the spent acid and salt solution which, because of its greater density, always settles to the bottom of the apparatus. In order to use the whole of the acid it is consequently necessary to agitate the liquid from time to time. To the writer's knowledge there is but one form of automatic generator on the American market in which this necessity is obviated, and that is somewhat complicated.

With a somewhat limited supply of apparatus at hand, the following arrangement was devised which proved so satisfactory and practicable, and withal so simple of construction, that it seemed worth while to publish a description of it. In this description the dimensions are omitted, as it will readily be seen that the sizes of the different parts will depend largely upon the gas to be prepared and the quantities in demand. The accompanying sketch will serve to show the general proportions of the apparatus in use in this laboratory.



A two-necked Woulff bottle, tubulated at the bottom, was used as an acid tank. The iron sulphide was contained in a glass tube, closed at its upper end with a one-hole rubber stopper fitted with a glass stop-cock, and at its lower end with a two-hole rubber stopper containing inlet and outlet tubes. The inlet tube terminates in a valve, *A*, opening upward just above the stopper, and is connected by rubber tubing to a glass tube passing through one neck of the acid bottle and terminating somewhat below the shoulder of the bottle. The outlet tube is open, and is connected by rubber tubing with another valve-tube, *B*, opening into the acid bottle through the tubulature at the bottom. The rubber tubes and the Woulff bottle being filled with dilute acid and the latter being placed at a suitable height above the generator, on opening the stop-cock, the acid enters the generator and the flow of gas commences at once. On closing the cock, the back pressure forces the acid from the generator back to the bottom of the acid bottle, and subsequent reopening allows the ingress of fresh acid into the generator. The second neck of the Woulff bottle was in this case connected with a trap for the absorption of any excess of hydrogen sulphide from the spent acid, and consisted merely of two bottles connected by glass tubing and containing a strong solution of potassium hydroxide. This would, of course, be unnecessary in many cases.

Separate sketches show the construction of the two valves, which will offer no difficulties to any one with slight skill in glass tube working. The valves are simply glass rods of suitable size, drawn out and ground into their seats with turpentine, camphor and emery, before being cut from the long rod. Holes are drilled in the inlet valve-tube *A* by the use of the camphor mixture and a drill made from a round file. To guard against any possibility of the valve in *B* being carried upward by the current of liquid and consequently stopping the upper opening of the valve-tube, its top is pinched flat while still soft in the flame. Devices for washing and drying the gas are omitted from the drawing, as they would obviously vary with the gas and the use to which it was to be put.

Liquid Air.[1]

The Cold Storage and Ice Association has done most useful service by inviting Dr. Carl von Linde to come from Munich to read a paper on "The Technical Application of Liquid Air." A meeting of the Association was held for the purpose on the evening of the 5th inst., at the Institution of Mechanical Engineers, the council of the latter society having lent their hall for the purpose. Mr. T. B. Lightfoot presided at the meeting. Probably the chief gain will be that authoritative denial has been given to the possibility of using liquid air for cold storage on a commercial scale. The fact is one upon which engineers have had very little doubt; but the wonders of the new and unknown have been freely used by those who were either ignorant or unscrupulous, perhaps both, in proposals to extract money from the unsuspecting public. The authority of one so well versed in the science and practice of refrigerating processes as Dr. von Linde is therefore extremely valuable. It is, however, as Dr. von Linde pointed out, not altogether surprising that liquefied air, which, vaporizing at atmospheric pressure, possesses a temperature of —191° C., should have been considered a good medium for refrigerating purposes. It should be remembered, however, that "the expenditure of energy necessary for a certain amount of cold increases in direct ratio with the difference between the lower temperature (in the refrigerator) at which the heat is taken away and the upper temperature (in the condenser or cooler) at which the heat is transferred to the cooling water or to the atmosphere." If, therefore, a temperature only some degrees below the freezing point of water be needed, it is irrational to employ liquid air. To use the author's simile, it is like sinking a 300-foot well for obtaining surface water from a depth of 10 feet. "If," continued Dr. von Linde, "we were to work our ice factories, our cooling and freezing stores, and our other cooling plants by liquid air, the requisite expenditure would be from thirty to fifty times greater than that of other modern refrigerating installations."

Notwithstanding the possibility of storing liquid air for an appreciable length of time, due to the invention of Dewar, its use does not appear to have extended far beyond the laboratory, where, however it is a useful agent in physical research. A small quantity—say a quarter of a gallon—when contained in one of the double walled and evacuated vessels, will take about 14 days to vaporize, a result which appears somewhat remarkable, seeing that the vessel must necessarily open to the atmosphere. At present the practical uses for liquid air suggested in the paper were "the local and limited cooling of rooms," and simple forms of apparatus for the purpose were illustrated by wall diagrams. Another use suggested was the cooling of wine. Small cylindrical glasses with double walls, and capable of receiving 4 or 5 cubic inches of liquid air, are placed before guests for using at discretion. The liquid will remain in these glasses unevaporated for several hours. A pint of wine can, by the addition of 1 cubic inch, be refrigerated by 4° F. The wine is not diluted, and, as a gallon of liquid air can be retailed for 5 shillings, it is possible such a cooling agent may become fashionable in select circles. In the latter part of his paper Dr. von Linde referred to the use of liquid air for motor purposes; a matter about which we heard a good deal a short time ago. This possibility, the author said, has been invested with much too great an importance. When it is considered that the mechanical work capable of being recovered from liquid air represents only a very small fraction of the work indespensable to liquefy the air, then we should be convinced that we can never speak of organizing, by liquid air, motive power of a rational, economically competitive or superior kind. But, as in technical refrigeration, cases may arise also here in which the question of economy will, for comparatively small quantities, be of secondary consideration, whilst certain properties of liquid air may offer conclusive advantages. He referred to submarine vessels and to conditions where it was of vital importance to reduce the weight of the motor to the utmost extent possible. In this connection the author also mentioned the more or less successful experiments which have been made with liquid air as a motive power for automobile cars. These efforts seemed to be not too far from realization. He would not go into the details because his experimental station had not taken up the matter, although it was intended to do so.

Others are, of course, working at this problem of using liquid air for power purposes, and Mr. Thrupp, who spoke in the short discussion which followed the reading of the paper, mentioned that he was about to make a series of investigations into the subject in conjunction with M. G. Claude, of Paris.

The chief interest of the paper undoubtedly consisted of that part in which the author referred to the manner by which oxygen can be seperated from the atmosphere by liquefaction. The two most important constituents of atmospheric air—nitrogen and oxygen—do not during evaporation remain in constant ratio to each other. The products of evaporation invariably contain more nitrogen and less oxygen than the evaporating liquid itself, and hence the liquid will become the richer in oxygen the longer evaporation continues. When, therefore, the products of evaporation corresponding to different periods are collected separately, gas mixtures of different constitution will result, and this fact has been actually utilized for obtaining gases rich in oxygen. By means of diagrams the author showed this effect quantitatively. The first products of evaporation contained about 7 per cent. of oxygen. When one-fourth the liquid remained, it was composed of equal parts of oxygen and nitrogen, and at the last instant of evaporation only the liquid would consist of pure oxygen. Therefore the fractional distillation of liquid air alone is not suitable for the production of gas mixtures greatly enriched by oxygen; but it is possible to attain that end by means which the author proceeded to describe. The cold developed by the evaporation of liquid air may be imparted to another quantity of air of a higher pressure, which is thereby reduced to condensation. If, by suitable apparatus, cold is transferred from the escaping products of evaporation to the incoming compressed air, so that the latter will enter the evaporator at its liquefaction temperature, then there will theoretically result for every gallon of air evaporating 1 gallon of condensed air. The disbursement of energy from the entire plant will be limited, first, to the compressing of the atmospheric air previous to its condensation; and, secondly, to compensating the losses of cold. The latter may be combined with the former either by raising the entire quantity of air to such a pressure (29 to 30 atmospheres) that the requisite quantity of cold is produced by expanding it through a throttle valve, or by compressing the air to be liquefied only to such an extent as its condensation will require (2 or 3 atmospheres) to make up the losses of cold by adding an equivalent of liquid air provided by an ordinary liquefaction machine.

In our issue for September 13, 1901 (vol. lxxii., page 368), we illustrated and described the apparatus designed by M. Raoul Pictet, the well known physicist of Geneva, by which oxygen may be separated from the atmosphere by means of liquefaction. This process is carried on by a system of heat interchanges; the gases evaporating be used to lower the temperature of the fresh supplies of air passing in to the apparatus, a supply of energy sufficient to compensate for loss in working, due to radiation and conduction, being afforded by keeping the air in the inlet pipes under pressure. This air under pressure passes through a series of copper pipes, the coils of which are more or less immersed in the liquid air. This process, it will be seen, is so far similar to that described by Dr. von Linde; but the addition of rectification appears to be a distinct improvement.

The paper proceeded to state that for a year past a special experimental station utilizing 150-horse power has been at work. In whatever manner apparatus producing oxygen by fractional distillation may be constructed, there must always be two essential parts. First, a counter stream apparatus for the exchange of heat between the incoming compressed air and the discharged products of evaporation. Secondly, there must be the evaporating apparatus in which the latent heat of the compressed air will, during its condensation, be conveyed to the liquid air under evaporation. Recently, however, a third important addition has been made. It has been shown that the production of gas mixtures very rich in oxygen is unattainable by fractional distillation, because approximately pure oxygen results only at the termination of evaporation, when there is only quite a small residue of the evaporating liquid. This disadvantage can be overcome by rectification. If, in a rectifying column—which may consist merely of a cylindrical vessel filled with glass beads or similar particles—the products resulting from the evaporation of liquid air very rich in oxygen are allowed to rise in a direction opposite to that of the condensed air entering from above, this latter will remove oxygen from the ascending gas current, and in its turn give off gaseous nitrogen, so that the condensed products will reach the bottom of the evaporator enriched by oxygen, whilst the gas current at the top end will contain only the quantity of oxygen corresponding to the constitution of atmospheric liquid air—*i. e.*, 7 per cent. This rectifying action—as also the entire phenomenon of fractionizing—is explained by the circumstance that the boiling point of oxygen lies about 23° F. higher than that of nitrogen. The author explained, by means of a diagram, how two-thirds of the oxygen present in the compressed air may be conveyed into the apparatus.

The apparatus used was also described and illustrated by wall diagrams. The counter cooler comprised the chief part of the entire plant,

1. *Engineering.*

The incoming air passed through copper tubes lying in horizontal planes, one above the other, and connected by collecting pieces. The discharged products of evaporation were led oppositely to the copper coils within channels formed by steel distance strips arranged between each pair of alternate surfaces. The evaporating apparatus was divided into a top and bottom compartment, to which the heat necessary for evaporating the liquid air was continually conveyed by compressed air in process of condensation. Into the upper vessel the condensed air and the liquid air were continually introduced from outside as compensation for losses. The liquid air for the most part would evaporate, and, highly enriched in oxygen, would overflow into the second vessel The products from the latter, after passing through the lower compartment of the counter cooler, would be conducted away for use. The products from the upper vessel would ascend through the rectifying column of the apparatus, and there effect an exchange of oxygen and nitrogen, and from thence, with about 7 per cent. of oxygen, escape into the atmosphere after imparting their cold to the incoming compressed air in the upper part of the counter cooler. Both evaporator and rectifier were surrounded concentrically by the counter current cooler, and the low temperatures gradually increased from the inside to the outside, from one coil to the next, in such manner that they would approximate in the outer coil to that of the external atmosphere. The cold emanating from the interior would be thus appropriated and reintroduced by the air current entering from without. In this way the losses of cold were reduced to a relatively very slight amount.

The author proceeded to state that the unavoidable expenditure of power for a determined quantity of oxygen had not been finally settled; but by 100-horse power there had been obtained hourly, without rectification, 3,500 cubic feet of a gas mixture composed equally of oxygen and nitrogen. With rectification it was possible to obtain hourly about 1,600 cubic feet of gas, containing more than 90 per cent. of oxygen. In reference to these figures as to cost, Mr. Addenbrooke pointed out in the discussion that, taking the value of 1-horse power hour at one-fifth of a penny, the cost for the 90 per cent. oxygen mixture would be 1s. 3d. per 1,000 cubic feet. This certainly appears a remarkable result, as it would be about half the price at which coal gas is often charged. Of course, however, the cost of distribution and general charges have to be taken into consideration in estimating the price of coal gas as delivered to consumers.

In reply to questions put to him after the reading of the paper, Dr. von Linde stated that latent heat of liquid air was nearly constant for all compositions, and might be taken at about 56 metric calories per liter. Theoretically, in a perfect machine ½-horse power hour should yield 1 liter of liquid air. Actually, with small plants for liquefying 25 liters per hour 50-horse power would be employed. In the motor there would be given off theoretically one-third the energy employed in liquefaction when the liquid air was evaporated, so that if the machinery produced the power without loss, one-third of the power would be recovered; but as the machines had not more than 50 per cent. efficiency, the proportion would certainly not be more than one-sixth. To obtain this result it would be necessary to expand from 800 atmospheres down to atmospheric pressure, thus using the whole range of temperature available. The meeting terminated with a vote of thanks to the author for his paper.

Coke.

[A paper read by Mr. N. P. HYNDMAN at the last meeting of the Pittsburg Foundrymen's Association.]

The subject assigned to me to present to-night is coke. I doubt if there is any other commodity used in foundry practice that is, just at this time, giving you more concern. The centralzation of the iron and steel interests has brought about a consolidation of coke interests, the result of which is that the large producers of iron and steel are the owners of their own coke works. This ownership is the manipulation of years, the buying up of coking plants and undeveloped land, until now we find the great Steel Corporation so much in possession, and their requirements of coke so large, that they have announced to the general foundry trade, through their coke department, the necessity of withdrawing their present production of foundry coke after this year. This is the reason, I say, that the matter of coke supply is no doubt causing some of you much anxiety. You, perhaps, have had a regular source of supply for years, of a quality that suited your work, and you must now look elsewhere and enter the experimental period again. The development of coke production has been so extensive in the last five years that I do not think you need fear any trouble in securing the quantity you want. In fact, there are now about 3,000 ovens under construction, or contemplated in this State, and most of these in the Pittsburg and Connellsville regions.

The coke subject has been a very interesting one from the date of its introduction in the manufacture of iron, especially since it has to a very large extent displaced anthracite coal and charcoal in the smelting of ores, and much may be said of its past history. I propose, however, to confine this paper more particularly to the period most interesting to our local trade conditions in the coke business from a salesman's standpoint.

About the year 1885 our esteemed fellow citizen, Mr. Frick, the largest producer of Connellsville coke, commenced to buy out his competitors, and continued doing so until he had secured a large part of the developed properties and coking coal land in the region. The result of his action is the extensive coke supply of the United States Steel Corporation to-day. Within the last five years a large addition has been made to the number of coke works in Fayette and Westmoreland counties, Pa., by large consumers and new investors. These developments are principally in the "Klondike" or Lower Connellsville District. Some of them have become the property of the United States Steel Corporation, while a number of other plants there are operated by individuals. Increased developments have also been made in the Greensburg and Latrobe districts.

Quality is the most interesting part of the subject to you, no doubt. Previous to 10 years ago the consumers demanded coke made in the Connellsville region between Mount Pleasant and Uniontown, as they considered that the heart of the region, and thought only there could coke of satisfactory structure, hardness and chemical analysis be found. They insisted sulphur should be 0.75 per cent., or not to exceed 0.85 per cent. Even in that section of the coke region the producer tried to impress you with the fact that the deeper the coal the better the coke. This may be true, but it did not prevent the drift mine producer from selling his coke at all times and in the same markets.

The development of coking coal lands adjoining the field above described was afterward commenced, and coke from the north end of the Connellsville region, and the Greensburg field, was accepted with favor. The quality of coal seemed to be satisfactory for coking except that the sulphur in some of it was higher than the trade would accept. This, however, was corrected by the coal washing process. The lower end of the Connellsville field, south of Uniontown, produced a coke that was said to be wanting in strength, but this impression is not held to-day.

The next field to come into prominence was the Masontown field in Fayette county, now called the "Klondike" or Lower Connellsville. Previous to 5 years ago no effort had been made by the farmers to sell these lands, but about that time some Pittsburg capitalists, anticipating an increased demand for coke, invested largely in this field, and it is to-day a beehive of activity in coke production. Two trunk line railroads enter the field with additional railroad facilities to be added. This coke is being shipped all over the country and used for all purposes. The quality is good. The same condition exists there as in all other coke territory—viz., that you may find some coal with sulphur a little higher than desired. This, however, if continuous, may be corrected with a washer. No washers, however, are in use there now.

I now want to speak of the quality of coke in general. The demand on the shippers for sulphur of 0.75 to 0.85 per cent. has not been continued during the last few years. We find the foundry consumers are as willing to accept coke with 1 per cent. sulphur as they were to accept 0.75 per cent. Whether the former demand was based on prejudice, or whether you have introduced such methods in your foundry practice as will enable you to use higher sulphur I do not know. The foundry coke shipper and his customer sometimes get into a controversy about quality of coke judging from its appearance, and the objectionable feature may be nothing more than black tops. I have been asked to go miles to see such coke, with the expectation on the part of the buyer that I will acknowledge it inferior, and almost pay him to keep it. The fact is the coke was hard, thoroughly burned, and in every way first class. The discoloration is the result of overheating of the oven, which melts the coal too suddenly, forming a crust over the top, which prevents the gases from escaping. These decompose and leave a deposit of lamp black in the cells of the forming coke. The result is "black tops." We also have in the manufacture of coke "black butts," which we acknowledge are objectionable, owing to the fact that the coke is not thoroughly burned, therefore soft. This coke is found at the base of the oven, due principally to insufficient heat in that part of the oven, and this may be caused by dampness in the earth on which oven is built, or from exposure of the empty oven before charging.

It is surprising how large a number of people interested in the consumption of coke, living remote from the coking coal fields, are ignorant of its mode of manufacture. You have had this subject presented to you very intelligently through the writings of your esteemed associate, Thos. D. West, and through the coke expert, John Fulton. I assume, however, that a concise explanation of the process in this paper would not be amiss.

The style of oven principally used in this country is the beehive type. The by-product type is being introduced, but the preference in America to date seems to be for beehive ovens. These remarks, therefore, refer only to the latter. They are built in solid rows of any number consistent with the character of the surface of the ground. They be "blank ovens" (single row built against a hill) or block ovens (double row on open ground). The coal is carried to them in "larries" holding enough coal to charge the oven, and running on a track built on top of the row of ovens. The coal is charged from the larry into the ovens through a hole in the top The process of applying the heat is where we find many people mystified, or laboring under a wrong impression. When the oven is new the heat is applied by burning wood until the bricks get thoroughly hot. The oven is then charged with coal, which ignites. The burning is from the top of the oven to the base. When the coke is ready to draw the door in front of the oven is opened and the cooling process started. This is done by quenching with water through a hose pipe, manipulated by the drawer. When cool enough to handle, the drawer pulls the coke out on the yard with a large iron fork, finishing the quenching outside, as too much water permitted in the oven would tend to reduce the heat. As soon as possible after the oven is emptied it is recharged from the larry with the same quantity of coal as before, and the burning process commences instantly from the heat in the oven. This continues during the entire period the oven is in operation.

Coke is burned 48 and 72 hours, 48 hours because a certain quantity of coal will burn in a certain sized oven that length of time with best results to produce the best quality of coke for blast furnace use. Seventy-two hour coke, being burned longer is harder, and consequently of better quality, and is especially adapted to foundry practice.

The abnormal trade conditions existing to-day between the coke seller and buyer as to price are causing much anxiety as to the future. Those of you having contracts, and being regularly supplied, probably do not realize the condition I refer to. Owing to the anthracite strike and the inability af the railroads to move the coke promptly a great scarcity has existed throughout the country, with the result that prices ranging from $8 to $14 per ton at ovens have been freely paid for foundry coke for spot shipment, in quantities ranging from 1 to 100 cars. Never in the history of the country has such a state of affairs existed before. Normal conditions would now soon apply if the railroads could promptly move the coke produced. I predict that with better railroad facilities, together with the increased production of coke, the consumer can expect prices that will more readily conform to the prices of iron.

Hand-in-Hand for Mischief.

The *Acetylene Journal* says, under the above title, that the hazard from using either kerosene or gasoline, when considered separately, is great enough, as everyone knows. But sometimes the use of the two illuminants results in serious accidents, as if the one would help the other on in its wicked work. Take the fire in the home of W. M. Smith, Cambridge, Vt., last month. A gasoline lamp was suspended from the ceiling, and, on a table just beneath it, someone placed a lighted kerosene lamp. The presence of the latter so increased the heat that an excessive amount of gas was produced from the gasoline above, causing an explosion with serious consequences. Not a week passes but one or more accidents are reported, of mistakes made in substituting one of these illuminants for the other, a mistake easily arising because of the similarity of the two fluids.

Sometimes it happens through filling a kerosene lamp from a gasoline can; again it occurs that grocers make the mistakes, and where kerosene is asked for the buyers carry home gasoline instead. The mere suggestion shows how certainly an accident is bound to follow when the gasoline then is used in a kerosene lamp. It is bound to explode. Many a precious life and many a home have been destroyed by the two illuminants thus working together as it were.

We regret to have to report the death, on the 12th inst., of Dr. Chas. R. Riebsam, who since 1896 has acted as Assistant Secretary to the Madison (Wis.) Gas and Electric Company. Deceased was in his 77th year, having been born in Muncy, Pa., September 3, 1826.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

The authorities of Seabright, N. J., having at last granted the necessary permission, the Consolidated Gas Company, of New Jersey, will pipe that place for gas forthwith.

At the annual meeting of the Rahway (N. J.) Gas Company the following Directors were elected: John Kean, H. Simmons, H. F. Kean, A. T. Reitmeyer, Julian Kean, James Maguire, John W. Whelan, F. A. Price and Francis Engel.

At a recent session of the City Council of Gadsden, Ala., the proprietors of the Gadsden Light, Coal and Ice Company were granted a franchise to there maintain and operate a gas plant.

We are requested to publish the following notice, issued at the instance of the Engineers' Club of Philadelphia, dated the 13th inst.: "The 25th anniversary of the Club will be celebrated by a banquet, to be held at the Union League Club, on the evening of December 6th, at 6.30 o'clock. Some of the most eminent and prominent engineers of the country will be present as guests and speakers, and in all its appointments the banquet will be one worthy of the important event which it celebrates. The subscription price has been fixed at $5, and members are privileged to invite guests at a per capita charge of $6. Members sending subscriptions for guests may send their personal cards to accompany the formal invitations. Checks should be drawn to order of George T. Gwilliam, Treasurer, 1122 Girard street."

Mr. John R. Kuster has been appointed Manager of the Colusa (Cal.) Gas and Electric Company vice Mr. P. M. Downing, who has been promoted to a responsible position, with headquarters in the main office in San Francisco, in the service of the Bay Counties Power Company.

Some time ago the city authorities of Buffalo, N. Y., with the City Council taking the initative, caused the appointment of a special committee, charged with the task of investigating the gas supply of the city, with particular reference to the failure of the local company to extend its mains in certain directions when called upon to do so, as to the fairness of the rates charged and as to whether it would be a wise proceeding to raise money for the construction of a gas plant, to be operated on municipal account. The gist of the report submitted to the Council under the instructions is appended—the recommendations were adopted: "(1), that the Commissioner of Public Works report to the Board all instances of refusal on the part of the Gas Company to lay mains in the extended lamp district; (2), that the corporation counsel report the legal obligations of the Company to lay such mains; (3), that the Commissioner of Public Works report what other profitable arrangements can be made for the illumination of the city; (4), that the corporation counsel draft a bill for submission to the Legislature authorizing the city to bond itself for the construction of a municipal plant; (5), that the Board of Aldermen adopt similar recommendations."

Write to the Jeffrey Manufacturing Company, of Columbus, O., for a copy of its complete and handsome new catalogue. It is numbered 72 and contains comprehensive, well described and thoroughly illustrated descriptions of its "elevating-conveying, power transmission machinery."

The well-equipped new plant of the Indianapolis (Ind.) Gas Company, which was constructed under the watchful direction of the Company's Superintendent, Mr. James Somerville, was put into satisfactory operation the morning of the 14th inst. The plant, which is located in North Indianapolis, on Langsdale avenue, close to the tracks of the Big Four Railroad, has a maximum daily capacity of 1,500,000 cubic feet. The new storage holder (3,000,000 cubic feet capacity) is almost completed.

A correspondent in Portland, Ore., forwards the following under date of the 12th inst.: "Now that long nights are upon us and much home entertainment is in vogue, gas bills show up much lighter than at the same time last season, and the difference is so great as to attract attention and comment. It is no surprise though to those who realize what a reduction in the rate of 40 cents per 1,000 cubic feet means. The rate prior to September was $1.90; now it is $1.50. This is the charge for both illuminating and fuel gas. The aim of the Company, as explained by President Adams, is to increase the consumption of

gas. In this respect the expectations of a liberal multiplication of consumers has been the result. A little over 2 years ago (September 1, 1900) the reduction from $2.37½ to $1.90 was made, and the public showed marked appreciation of the concession. Hundreds of people had gas fixtures or gas stoves installed as a consequence. A similar increase in the number of patrons has followed the reduction this fall, and consumers note a very appreciable difference in the size of their bills, in the right direction. Such voluntary steps on the part of the management of the Gas Company exceeds in effect the exacting expectations of the public. Withal, the Company is extending mains into new districts with an energy and at an expense that would do credit to a very much larger manufacturing concern."

A COMPANION piece to the above is afforded in the following from a recent issue of the Paterson (N. J.) *Press*, which is also ample proof that those veterans in the gas business, Messrs. Rogers and Williams, are faithful to their old-time practices: "A public announcement was made the last of October by the Paterson and Passaic (N. J.) Gas and Electric Company, that on and after November 1st the price of gas would be reduced from $1.20 to $1.15, with a discount for prompt payment of 10 cents per 1,000 cubic feet, or a net price of $1.05 per 1,000. This reduction is in accordance with the Company's promised concession, made at a time when the abnormal increase in the cost of fuel, owing to an unforeseen coal strike, could not be anticipated, and is, therefore, all the more gratefully acceptable to the Company's many customers. To meet this loss of income, which in the aggregate will, of course, amount to a considerable sum, the Company relies on the increase in business which naturally follows a diminution of cost to the purchaser. The appeal made for a continuance of public support and an augmentation of new customers is therefore reasonable and deserving of public consideration. With gas now at only 5 cents over the $1 its use for cooking, heating and many other purposes will be as economical as it is in every way practicable and satisfactory. The lowering of the retail price of gas is undoubtedly responsible for the greater excellence of the lighting of stores and other places of business in our cities, and there is no factory, store, shop or house located along the line of the Company's mains that will not now be illuminated brilliantly at comparatively small expense. The stimulus to business in all branches will thus tend towards general prosperity, which is especially welcome at this time of the year when winter and the holiday seasons are at hand."

THE proprietors of the Excelsior Coke and Gas Company, of Topeka, Kan., report a large increase in output. Supt. R. E. Cowdrey has completed the betterments and extensions to the main system, the planning for which was made last fall.

THE Directors of the Consolidated Gas Company, of Baltimore, Md., have declared a dividend of 1½ per cent., payable the 1st prox.

MR. P. E. BELL, Manager of the Northwest Light and Power Company, of Everett, Wash , has been authorized to double the generating capacity of the plant. He also has underway a plan that calls for the placing of about 2 miles of additional mains. The Company has adopted the 3-shift, 8-hour system.

MR. WILLIAM STEWART has been appointed Superintendent of the electric division of the business of the Adams (Mass.) Gas Company.

MR. GEORGE COLEMAN has resigned from the service of the United Gas and Electric Company to accept a responsible position with the Equitable Gas Company, of Memphis, Tenn.

AT the annual meeting of the Brooklyn (N. Y.) Union Gas Company no change was made in the Board of Directors.

MR. FRANK GATES has been appointed Superintendent of the Coshocton (O.) Gas Company. Mr. Ernest Smith has been made Secretary and Treasurer of the Company.

IT is said that the next General Assembly of the State of Connecticut, which will convene the 1st of the new year, will be especially appealed to for the framing of laws enabling the local authorities to construct and maintain gas and electric lighting plants on public account.

MR. C. B. JACOBS has resigned the post of Manager to the Consolidated Gas Company, of Marietta, O. His successor is Mr. A. Schnaufer, who assumed charge the 15th inst.

THE proprietors of the Mohawk Gas Company, of Schenectady, N.Y., have purchased a large tract of land in the 9th Ward of thatcity, whereon it is proposed to eventually construct a new plant. That construction, however, will not be gone on with for some time.

MESSRS. W. A. BISSELL, Walter P. Treat, N. T. Messer, Jr., Edwin Schwab and W. C. Webb have incorporated the Richmond Light and Power Company, to furnish light and power to the residents of Richmond and other towns in Contra Costa county, Cal. It is capitalized in $150,000.

THE proprietors of the Batavia (N. Y.) Consolidated Gas and Electric Company are constructing a coke oven plant. The plans call for the placing of 6 ovens of the following dimensions: 17 feet 10 inches long, 5 feet 6 inches high and 5 feet 6 inches wide. It is proposed to use a certain proportion of the gas produced for the supply of the residents of Batavia.

THE Consolidated Gas Company, of Baltimore, Md., is arranging for the establishing of sub-offices throughout the city for the better convenience of customers in paying their bills.

D. F. GREENE, of the City Council of Marshalltown, Ia., has asked his fellows of the Council to pass a resolution ordering a special election for the purpose of determining whether or not "The city shall erect, maintain and operate a gas and electric lighting plant for the supply of gas and electric currents on public and private account."

MR. C. F. SUGG, the Manager of the Huntsville (Ala.) Gas Light Company, is busily engaged in carrying out a comprehensive scheme of plant reconstruction. He estimates the cost of the betterments at $50,000.

MR. D. TURNBOLT, of Lincoln, Ills., has been appointed Superintendent of the consolidated gas and electric lighting interests of Louisiana, Mo.

THE New London (Conn.) Gas and Electric Company has decided to double the capacity of its electric lighting plant.

MR. FRED. H. SARGENT has been promoted to the position of Assistant Agent to the Lawrance (Mass.) Gas Company, with a view to relieving Agent C. J. R. Humphreys of detail work. Mr. Sargent was works' superintendent of the Company.

THE *Gas World* notes that the question of municipalizing the undertaking of the Australian Gas Light Company was discussed in the New South Wales Parliament in August. A member proposed a long resolution to the effect that in the opinion of the House the action of the Company in continuing to charge the "exorbitant" rate of $1 per 1,000 cubic feet for gas was prejudicial to the progress of the city of Sydney and warranted the Government taking over the works and placing them under the control of the City Council, with the object of supplying all consumers at a reduction of 30 per cent. and thereby liberating the people "from the painful necessity of continuing to be supporters of a monopoly which annually declares enormous dividends." The mover pointed that there was no check in Australia, as in England, on the amount of dividend payable by gas companies, and that shares were not issued by means of auction or tender but were allotted to existing shareholddrs. The Company, he said, paid 15 per cent., free of income tax. He spoke of the financial results of municipalization in England and of the great sums handed over from gas profits in aid of rates. With regard to electricity, he believed it would never supersede gas as an illuminant; incandescent gas light cost much less than electricity. While 17 municipalities in New South Wales had gas works, 7 had electric lighting plants, and the latter were all failures. In opposition to the motion one member argued that as the Sydney City Council were about to initiate an electric lighting undertaking the Australian Gas Light Company would soon be a thing of the past. More powerful arguments than this were advanced, however, and amongst other things it was pointed out that the City Council had expressed no desire to take over the works, Eventually the motion was negatived.

THE AMERICAN GAS LIGHT JOURNAL

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Notification Respecting Advertising.—Orders for new advertising, or for changes in standing advertisements, to insure attention in the issue following their reception, must be in hand any time of Wednesday.

AGENTS:
New York—American News Co. 39 and 41 Chambers St.
Germany—Lemcke & Buechner, of New York.
England—Aug. Siegle, 90 Lime Street, London.

MONDAY, NOVEMBER 24, 1902.

The Market for Gas Securities.

A decided change for the better is shown in the quotations for city gas shares, the improvement, of course, being directly attributable to the slowly mending conditions governing the money market and the general feeling prevalent that the lowest levels in speculative value were reached early this week. Consolidated closed to-day (Friday) at 215 to 215½, and there was quite a persistent demand for it all day. There is considerable of a short interest in it outstanding, wherefore it would not be astonishing to witness a quick rise when the speculators have to cover.

Brooklyn Union is nominally 228 to 230, but the trading in it is virtually nil. At the annual meeting no change was made in the executive management. It is said that plant improvements on a large scale are projected. In out-of-town shares Peoples, of Chicago, scored a sharp advance, while Baltimore Consolidated is barely steady, having sold down to 71, ex-div. of 1½ per cent. Washington (D. C.) is again on the upward move. Gas bonds of all classes continue to attract the attention of investors.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.
16 WALL STREET, NEW YORK CITY.

NOVEMBER 24.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	215	215½
Central Union, Bonds, 5's	3,000,000	1,000	110	112
Equitable Bonds, 6's	1,000,000	1,000	105	
" 1st Con. 5's	2,500,000	1,000	118	120
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	350	..
Municipal Bonds	750,000	..	..	..
New Amsterdam Gas Co. ..				
Bonds, 5's	11,000,000	1,000	112½	113
Northern Union, Bonds, 5's.	1,250,000	1,000	108	110
New York and East River..				
Bonds 1st 5's	3,500,000	1,000	112	113
" 1st Con. 5's	1,500,000	..	109	111
Standard	5,000,000	100	130	140
Preferred	5,000,000	100	150	160
Bonds, 1st Mortgage, 5's	1,500,000	1,000	115½	118
Yonkers	299,800	500	130	
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	224	230
" " Bonds (5's)	15 000,000	1,000	119	119½
Bay State	50,000,000	50	1¼	1⅝
" Income Bonds	2,000,000	1,000	.	75
Binghamton Gas Works...	450,000	100	28	30
" 1st Mtg. 5's	509,000	1,000	93	96
Boston United Gas Co.—				
1st Series S. F. Trust....	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	10½	11
" " Bonds, 5's	5,250,000	1,000	79	81
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000		
Central San Francisco	000,000	..	106	108
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Cincinnati Gas & Elec. Co..	29,500,000	100	99	100
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	101	101½
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	88¼	89½
Preferred	3,026,500	100	107½	109
Consumers, Jersey City Bonds	600,000	1,000	102	103
Consumers, Toronto	1,700,000	50	218	225
Consolidated, Baltimore...	11,000,000	100	71	71½
Mortgage, 6's	3,600,000	..	..	115
Chesapeake, 1st 6's.	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's....	1,490 000	..	.	112
Consolidated Gas Co. of N.J.	1,000,000	100	15	17
" Con. Mtg. 5's	380,000	1,000	85	87
Consolidated G. & E. Co.'s. Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co	4,825,500	50	.	89
" Prior Lien 5's	5,603,000	1,000	99½	100
Detroit Gas Co., 5's	382,000	1,000	77	79
" Inc. 5's	16,000	100	94	94½
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	34	38
Fort Wayne	2,000,000	..	.	.
" Bonds	2,000,000	..	55	..
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	245	265
Hudson County Gas Co., of New Jersey	10,500,000	..	25	..
" Bonds, 5's	10,500,000	..	101	103
Indianapolis	2,000,000	..	70	80
" Bonds, 6's	2,650,000	..	103¾	104½
Jackson Gas Co	250,000	50	73	75
" 1st Mtg. 5's	290,000	1,000	101	102½
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	.	90
Preferred	2,500,000	100	..	116
Bonds	10,000,000	1,000	109½	110
Lafayette Gas Co., Ind.	1,000,000	100		60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	112	120
Madison Gas & Elec. Co.				
" 1st Mtg. 6's	350,000	1,000	107½	108½
" 6 per cent. scrip, due 1910	100,000	25	25	87
Montreal, Canada	2,000,000	100	218	184¾
Newark, N. J., Con. Gas Co	6,000,000	..	56	58
Bonds, 6's	4,600,000	..	105	105¾
New Haven	1,000,000	25	300	325
Nashville Gas Lt. Co.	1,000,000	100	110	..
Oakland, Cal.	2,000,000	..	46	47
" Bonds	750,000	..	..	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	102	102½
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	..	..
2d "	2,500,000	1,000	104	
Rochester Gas & Elec. Co..	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	10,000,000	100	48	48½
St. Paul Gas Light Co.	1,500,000	100	45	47
1st Mortgage 6's.	650,000	1,000	113	116
Extension, 6's	600,000	1,000	113½	115
General Mortgage, 5's..	2,465,000	1,000	92	93
St. Joseph Gas Co.				
" 1st Mtg. 5's	751,000	1,000	95	96½
Syracuse, N. Y.	1,975,000	100	29	..
Bonds	2,047,000	1,000	99½	100
Washington, D. C	2,600,000	20	378¾	382½
First mortgage 6's.	600,000	..	..	..
Western, Milwaukee.				
Bonds, 5's	4,000,000	..	109½	110
Wilmington, Del.	600,000	50	232	..

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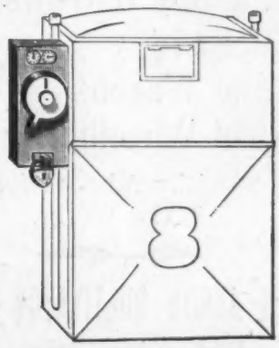

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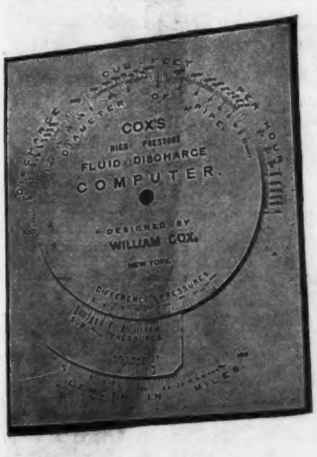

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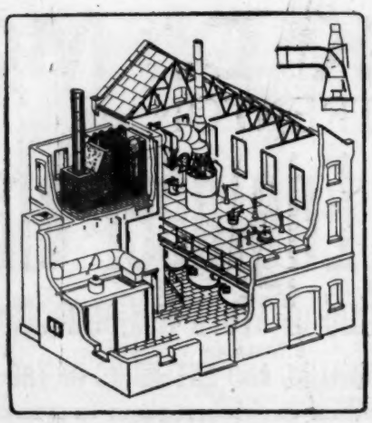

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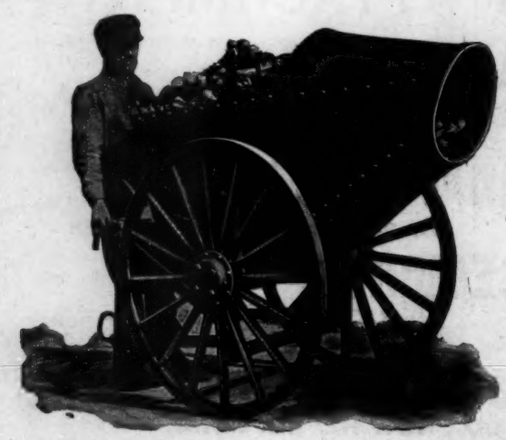

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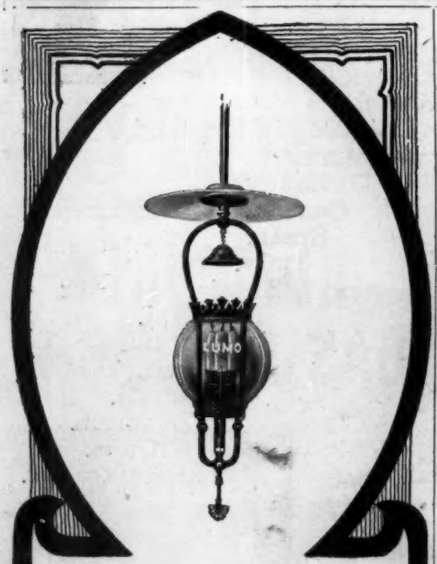

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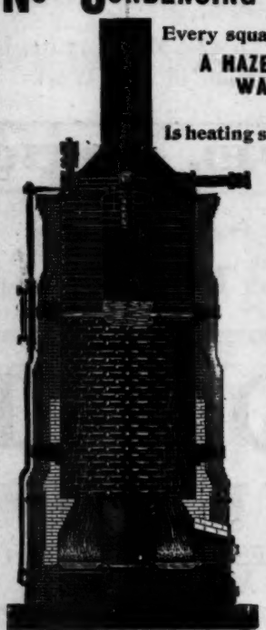

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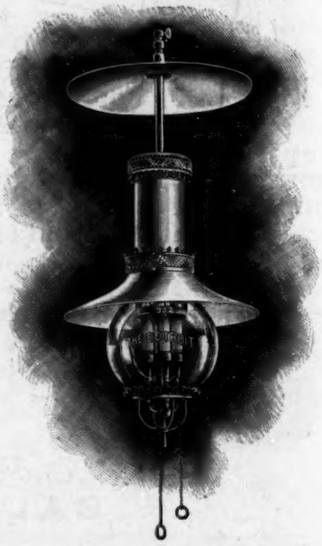

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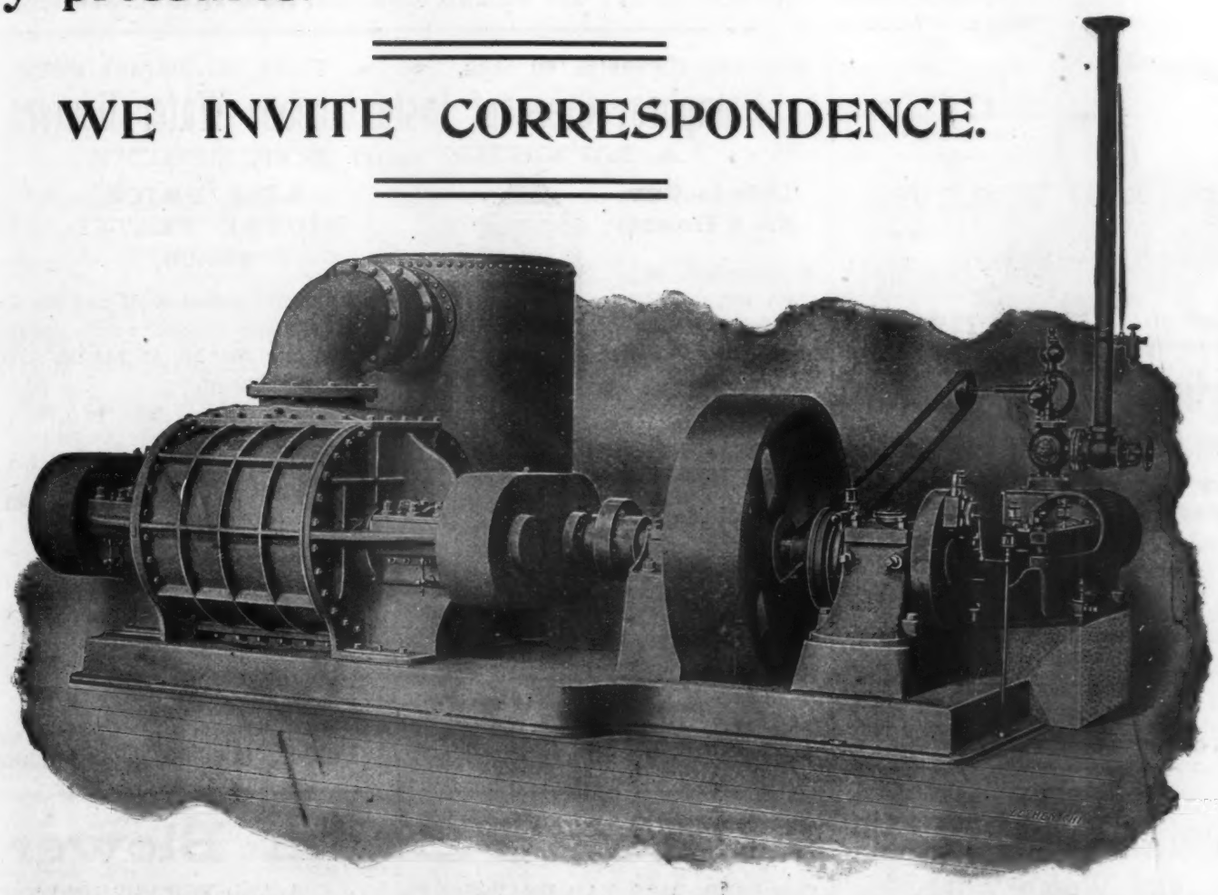

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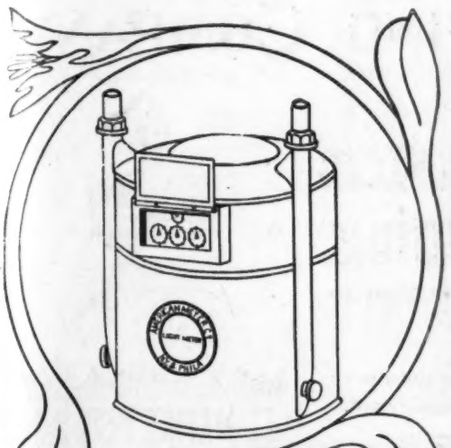

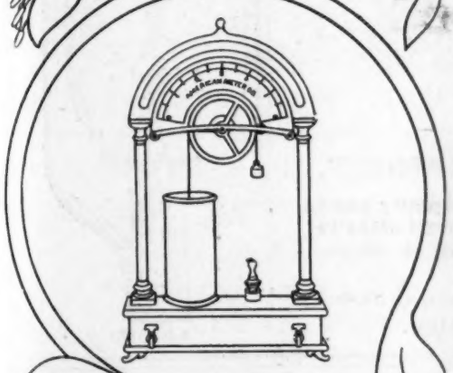

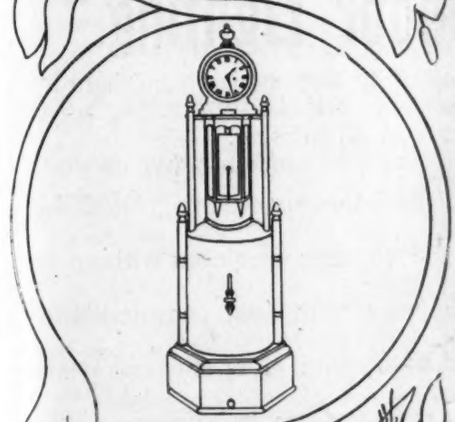

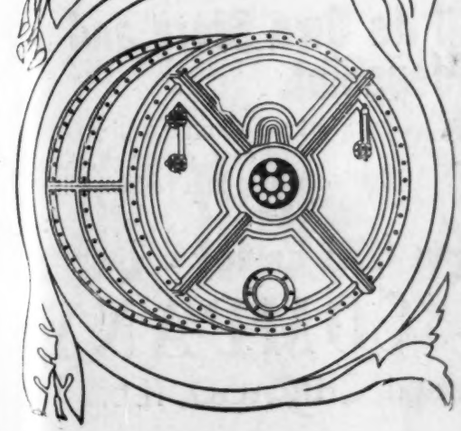

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NEW YORK AND PHILADELPHIA,

CHICAGO, ST. LOUIS,

SAN FRANCISCO.

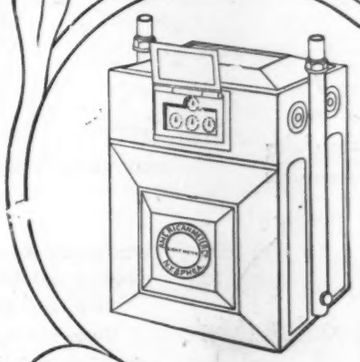
PUBLIC LIGHTING TABLE.

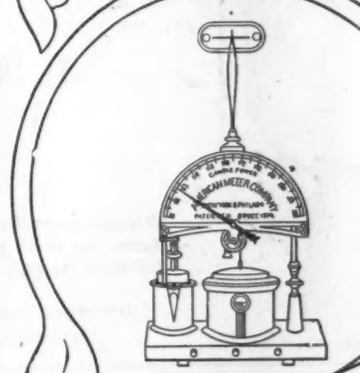
DECEMBER, 1902.

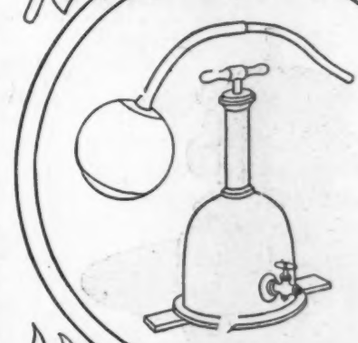
Day of Week.	Date.	Table No. 1. Following the Moon. Light.	Table No. 1. Following the Moon. Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Table No. 2. New York City. All Night Lighting. Extinguish.
				P.M.	A.M.
Mon.	1	5.00 PM	6.00 AM	4.20	6.10
Tue.	2	5.00	6.00	4.20	6.10
Wed.	3	5.00	6.00	4.20	6.15
Thu.	4	7.50	6.00	4.20	6.15
Fri.	5	8.40	6.00	4.20	6.15
Sat.	6	9.40	6.00	4.20	6.15
Sun.	7	10.40 FQ	6.10	4.20	6.15
Mon.	8	11.40	6.10	4.20	6.15
Tue.	9	12.50 AM	6.10	4.20	6.15
Wed.	10	1.50	6.10	4.20	6.20
Thu.	11	3.00	6.10	4.20	6.20
Fri.	12	4.10	6.10	4.20	6.20
Sat.	13	No L.	No L.	4.20	6.20
Sun.	14	No L. FM	No L.	4.20	6.20
Mon.	15	No L.	No L.	4.20	6.20
Tue.	16	5.10 PM	7.40 PM	4.20	6.20
Wed.	17	5.10	9.00	4.20	6.20
Thu.	18	5.10	10.10	4.20	6.20
Fri.	19	5.10	11.10	4.20	6.20
Sat.	20	5.10	12.20 AM	4.20	6.20
Sun.	21	5.10 LQ	1.20	4.20	6.20
Mon.	22	5.10	2.20	4.20	6.20
Tue.	23	5.10	3.20	4.20	6.20
Wed.	24	5.10	4.20	4.20	6.25
Thu.	25	5.10	5.20	4.20	6.25
Fri.	26	5.10	6.20	4.20	6.25
Sat.	27	5.10	6.20	4.20	6.25
Sun.	28	5.10	6.20	4.20	6.25
Mon.	29	5.10 NM	6.20	4.20	6.25
Tue.	30	5.10	6.20	4.20	6.25
Wed.	31	5.10	6.20	4.20	6.25

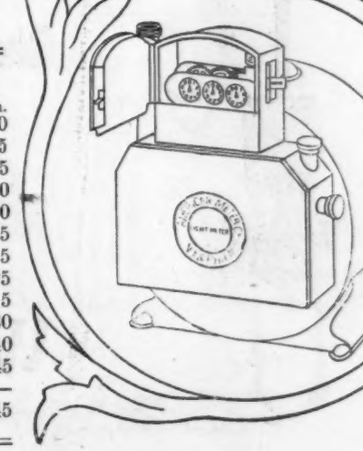
TOTAL HOURS LIGHTING DURING 1902.

By Table No. 1.	Hrs.Min.	By Table No. 2.	Hrs.Min.
January	238.30	January	423.20
February	196.20	February	355.25
March	196.20	March	355.35
April	166.40	April	298.50
May	151.40	May	264.50
June	131.10	June	234.25
July	142.40	July	243.45
August	162.00	August	280.25
September	179.00	September	321.15
October	216.30	October	374.30
November	224.10	November	401.40
December	250.00	December	433.45
Total, yr.	2255.00	Total, yr.	3987.45





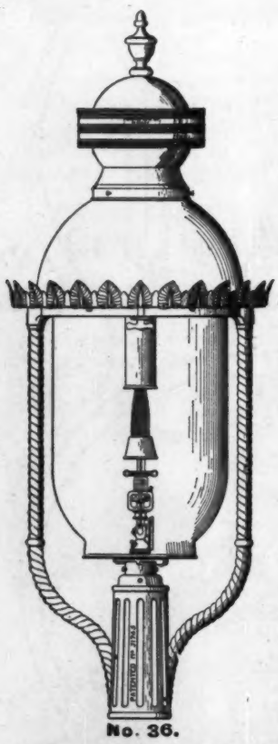




NEW YORK, 33 Nassau Street. PHILADELPHIA, Broad and Arch Streets. CHICAGO, Foot of Orleans Street. BOSTON, 624 Tremont Building.
CLEVELAND, 809 Cuyahoga Building. ST. LOUIS, 712 Roe Building. SAN FRANCISCO, 712 Polk Street.

WELSBACH STREET LIGHTING COMPANY

.... OF AMERICA ....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Which includes its specially DESIGNED AND PATENTED BURNER for STREET and PARK LIGHTING exclusively.

Uniformly SUCCESSFUL in 150 Cities and Towns.

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POINTS OF MERIT:

It is { Economical, Attractive, Successful, Up-to-date.

IT LIGHTS THE STREET.

Where there are no gas mains we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, and thereby supply a uniform light in all localities.

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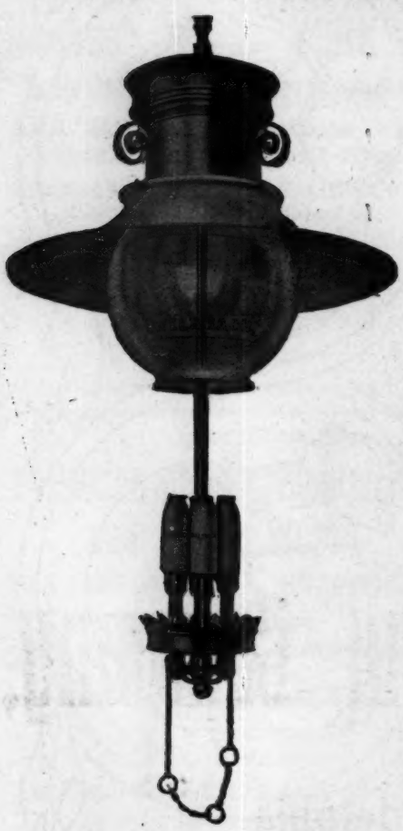
No. 38.

The Welsbach Gas Arc for Indoor Lighting.



The cut tells the story—but not all of it. Get one lamp and light it—then the tale's told from beginning to end. For one Welsbach Gas Arc Lamp is a better salesman than 20 pages of advertising.

Here's what it would show if you give it a chance to prove its worth:

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Let us send you one lamp—doesn't cost a fortune—and it will answer every question you put to it; make good on every test given it. You know the only proof of the pudding? What's the use in a fellow telling you it tastes good? Taste it yourself, then you know.

May we Send you ONE Lamp?

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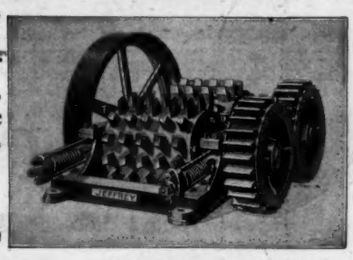

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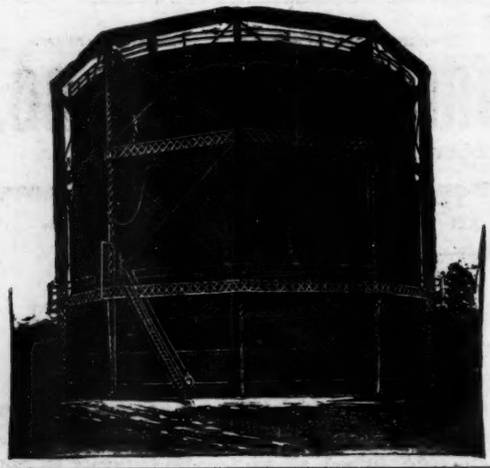

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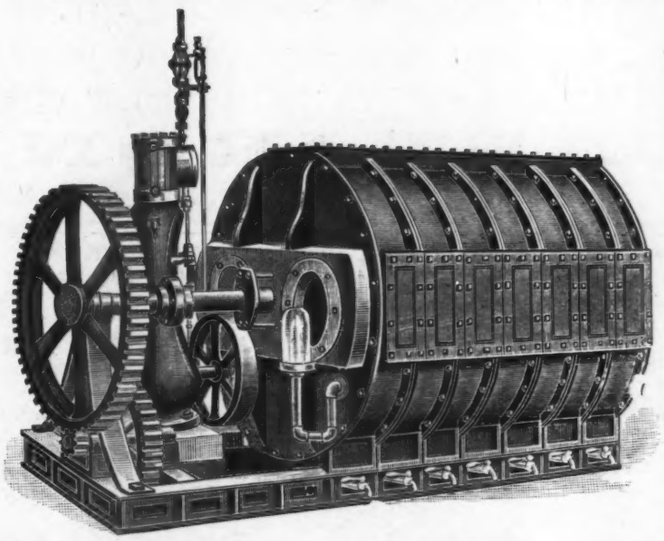

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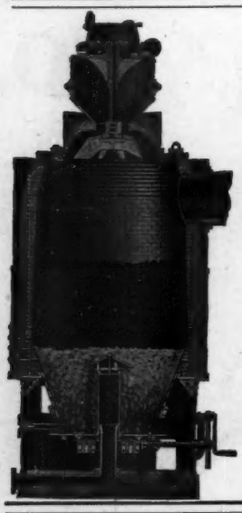

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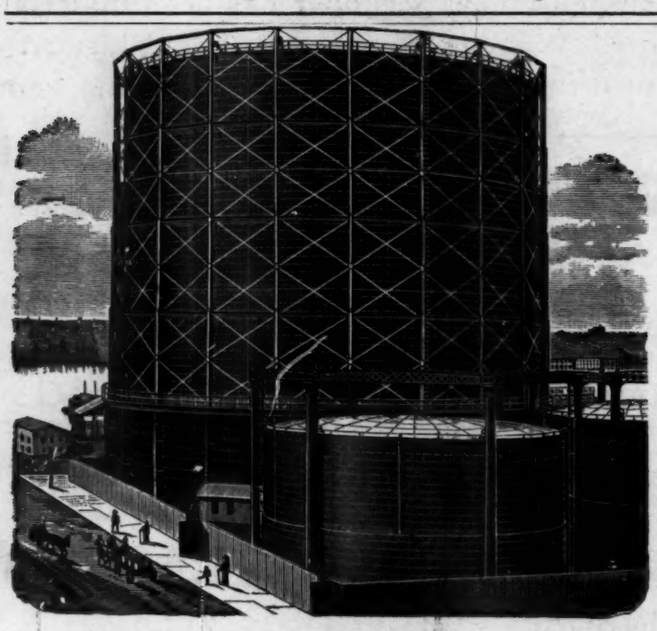

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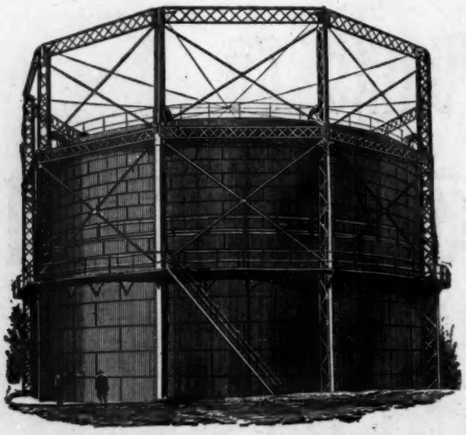

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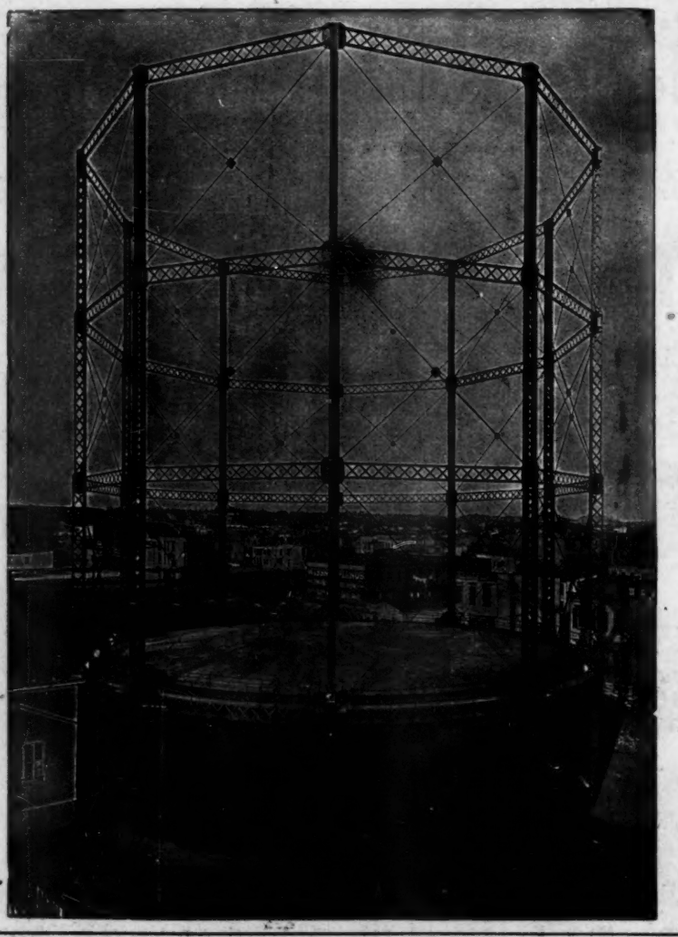

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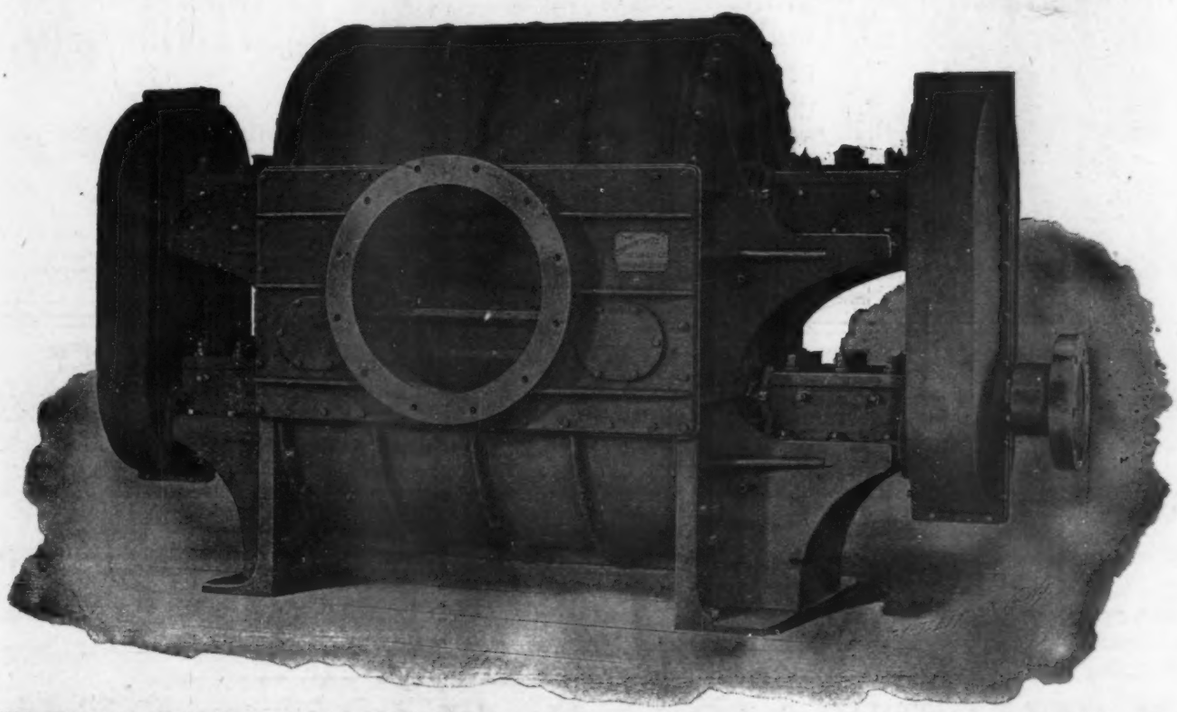

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